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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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75-1799. Anonymous. **Insecticides and cancer.** *Br. Med. J.* 1(5951): 170; 1975. (1 reference)

The manner in which it was decided that aldrin and dieldrin should be removed from further contact with the American public is criticized. The suggestion that these compounds pose "an unreasonable risk of cancer" is based on the production of tumors in the livers of mice given diets containing aldrin or dieldrin; some tumors metastasized to the lungs. However, it is noted that similar tumors occur in mice on normal diets and can be produced by other compounds such as DDT and phenobarbitone. Thus, it becomes a matter of opinion how far the production of these liver tumors in mice given aldrin or dieldrin is a reliable index of a hazard to man. It is not the facts themselves which are disputed, but rather their interpretation.

75-1800. Ihnat, M.; Khan, S. U.; Shearer, D. A. (Chem. Biol. Res. Inst., Agric. Canada, Ottawa, Ontario, Canada). **Chemistry and Biology Research Institute, Agriculture Canada.** *Chem. Can.* 27(6): 42-43; 1975.g In the Chemistry

In the Chemistry and Biology Research Institute of Agriculture Canada, the pesticide group deals with the analytical chemistry of a number of insecticides, fungicides, herbicides, and growth regulators present in animals, plants, soil, and water. Additionally, research is conducted on the persistence, binding, translocation, and chemical and biodegradation of pesticides in the biosphere. Gas chromatography, liquid chromatography, and mass spectrometry are the dominant techniques with heavy reliance on gas chromatography. Detectors used in gas and liquid chromatographs are evaluated. Chlordane is one of the few persistent organochlorine insecticides used in Canada currently. Studies on the metabolism of its 2 major components, *cis* and *trans* chlordane, show that residues are readily absorbed from soils by carrots but are not degraded into other products. Seven metabolites, however, have been identified in the urine of rabbits. The metabolism of lindane in chickens, farm animals, and soils has been studied. Work on the metabolism of ^{14}C carbathiin (Vitavax) is briefly reviewed. Analysis of technical samples of insecticides for small amounts of physiologically active impurities is carried out. Sensitive analytical procedures were developed for residues of paraquat and diquat in field treated soils and crops. Other investigations have dealt with chemical derivatization, mesurol and its metabolites, atrazine and hydroxyatrazine and malathion.

75-1801. Gibney, L. Y. (Chemical Engineering News, Washington, D. C.). **EPA seeks substitutes for banned pesticides.** *Chem. Eng. News* 53(23): 15-16; 1975.

The Environmental Protection Agency is well under way with a program to identify pesticides that can act as substitutes for other pesticides that have either been banned or face the threat of being banned. Thus far, 40 products have been identified as probable substitutes for problem pesticides. The review of possible substitutes takes into account both scientific and economic factors. Scientific considerations include the chemistry, toxicology, pharmacology, and environmental fate of the product. Economic considerations include the costs and benefits to the user and to society of increased use of the substitute. To date the agency has studied substitutes for aldrin, dieldrin, and DDT which have been banned; for chlordane and heptachlor which are in litigation; for 2,4,5-T; and for ethylenebisdithiocarbamate. It has been confirmed that methyl parathion, parathion, malathion, phorate, and demeton are fully suitable to act as substitutes for certain uses of DDT, and bromacil for certain uses of 2,4,5-T. For each substitute a report is issued giving the scientific data base for the chemical and also a position paper on the pesticides safety and efficiency. The research effort backing up the substitute chemicals program, besides providing the scientific and economic bases for the program, also provides data with respect to analytical methods, environmental monitoring techniques, and human effect testing procedures. There are 4 major subject areas: toxicological methodologies and evaluation research; screening techniques for "genesis" problems; acceptable and usable alternative methods of pest control; and movement and fate of pesticides in the environment.

75-1802. Newman, J. F. (ICI Plant Protect., Ltd, Jealott's Hill Res. Stn., Bracknell, Berks., England). **Handling toxic chemicals—environmental considerations. I. Introducing a new agricultural chemical.** *Chem. Soc. Rev.* 4(1): 77-81; 1975.

The determination of the likely environmental behavior of a new agricultural chemical before it goes into commercial use is discussed. Field plots are treated with new pesticides at application rates near to those most likely to be used in commercial practice, and others at grossly excessive rates. Observations are made of the behavior of the pesticide residue in the soil in terms of penetration down the soil profile and rate of decomposition. Careful and detailed observations are made on the effects of the treatments upon various small forms of life in the soil. Measurement of the microbiological activity in the soil includes total respiration, rate of conversion of ammonia into nitrate, and the rate of breakdown of soil oganic matter. Measurements are made of total microbiological biomass in the soil by estimates of the ATP content by a luminescent biometer and of the desoxyribonucleic acid content by a specific staining reaction in soil dispersion in an agar film. The effects in the field on vertebrate animals, especially on birds, are measured particularly when a chemical is to be used as a seed dressing. The environmental effects of DDT and mercury fungicides are discussed.

75-1803. Korte, F. (Inst. Ekol. Chem., Gesellschaft fuer Strahlen- und Umweltforschung, Munich, Germany). **Chemische aspecten van de kwaliteit van ons milieu.** [**Chemical aspects of environmental quality.**] *Chem. Weekbl.* 69(44): C23-C27; 1973. (Dutch)

General problems of environmental quality and the use of organic chemicals, including pesticides, are discussed. As revealed by calculations based upon estimated production figures, global contamination of the environment with organic fertilizers and pesticides at hazardous levels is impossible, i.e., contamination is merely of a local character. In addition, pesticides are broken down in soil, water, and living organisms, while some types, especially organochlorine preparations, accumulate in food chains. The exact knowledge of the production figures and of the quantities of pesticides used for different purposes in different media would be helpful in the study of the environmental effects, including the effects on wildlife.

75-1804. Anonymous. **Research and experiment.** *Int. Pest Contr.* 17(2): 2-3; 1975.

Progress in research and experiments in the pesticide field in Great Britain is summarized. Methods were established by the Government Chemist for the determination of quintozene in tomatoes, lettuces, and bananas; simultaneous determination of captan, folpet, and captafol in apples, bananas, apricots, oranges, and prunes; and determination of binapacryl in apples, cherries, peaches, pears, and plums. A joint report of the WHO and FAO covers the toxicological aspects of organomercury compounds, hexachlorobenzene, and other compounds and analyzes the need for seed dressings in agriculture. The British Agrochemicals Association reports it takes a pesticide manufacturer between seven and nine years and as much as three million pounds to put a new compound onto the market. A study initiated by Information Research Ltd will evaluate the extent of pest damage to various crops in different geographical areas, and identify the role of the industry in relation to increasing crop yeilds on a world wide basis. A series of pesticides was recently made available for the control of mildew, yellow rust, septoria, and rhynchosporium on cereals.

75-1805. Hugunin, A. G.; Bradley, R. L., Jr. (Dep. Food Sci., Univ. Wisconsin, Madison, WI 53706). **Exposure of man to mercury. A review. I. Environmental contamination and biochemical relationships.** *J. Milk Food Technol.* 38(5): 285-300; 1975.

The use of mercury compounds in the paint and paper industries and in agriculture because of their bactericidal and fungicidal properties is discussed. Incorporation of phenyl Hg compounds into water based paints inhibits mildew formation on painted surfaces as well as prolonging shelf life of paint in the can. For one manufacturer, the amount of phenyl Hg added per gallon of paint ranged from 0.45 g Hg for interior water based paint to 3.41 g Hg for exterior alkyd based paint. Significant concentrations of Hg were found in the atmosphere of a room freshly painted with paint containing a mercurial fungicide. The use of Hg based slimicides was discontinued in recent years as a result of the Federal Food and Drug Administration action precluding the use for paper used in food packaging. The highest rates of application of mercurial fungicides are for turf management. An inorganic mercurial fungicide containing 60% HgCl and 30% HgC^{12} offers broad spectrum activity and residual effectiveness. Commonly applied only to the golf course greens, approximately 0.00204 kg on an elemental basis of Hg compounds are applied annually to 182.1 hectares of greens in the state of Wisconsin. Many commercial fertilizers, herbicides, and fungicides for use on home lawns contain Hg compounds.

75-1806. Miyamoto, J. (Author address not given). [**Organophosphorus pesticides.**] *Kagaku Kogyo (Chem. Ind. Tokyo)* 26(2): 171; 1975. (12 references) (Japanese)

Organophosphorus pesticides are reviewed. Since DDT and BHC became prohibited or limited in their use, the use of organophosphorus pesticides has increased. They are effective mainly as insecticides and fungicides, and they can be used as herbicides in some cases. In 1972, the total use of organophosphorus pesticides in Japan was 8200 tons of which 6700 tons were insecticides and 1500 tons were fungicides. Because of the large number of possible structures, the most effective pesticides are readily prepared as organophosphorus compounds and their effectiveness can be varied. The residues of organophosphorus compounds in crops are very small, since rapid degradation of these compounds generally occurs. As long as these pesticides are sprayed within the established limit, no toxicity to humans or the environment will result.

75-1807. Wakatsuki, S. (Jpn. Soc. Rural Med., Saku Gen. Hosp., Usuda, Nagano, Japan). [**Report on studies supported by the Ministry of Health and Welfare in the fiscal year 1973.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(1): 39-46; 1975. (Japanese)

Of studies commissioned by the Ministry of Health and Welfare in 1973, 7 concerned health aspects of pesticides. These consisted of a clinical study of pesticide poisoning, studies on the health management of personnel engaging in pesticide application, the diagnostic standards of dermatitis due to pesticides, in investigation of pesticide residues in the human body, an experimental study of organophosphorus pesticide residues in living bodies, a neurological study on the treatment of organophosphorus pesticide intoxication, and electron microscopic study on the acute toxicity test of fenitrothion. Some of the results have been published elsewhere and in this journal; in this paper, the outline of the results are described briefly but comprehensively.

75-1808. Wilhelmson, G. (Avdelning for tillampad mikrobiologi, Karolinska Inst., Solna, Sweden). **PCB-forekomst och nedbrytning.** [**Polychlorinated biphenyls, occurrence and degradation.**] (15 references) (Swedish)

Studies and facts on the occurrence, migration, and degradation of PCBs in the environment are reviewed. The

acute toxicity, being rather moderate, decreases with the increase of the rate of chlorination in some animal species, and increases in others. Contamination of the atmosphere, soil, and water bodies by PCBs is possible, while direct entrainment by animals is negligible. Because of their liposolubility PCBs, especially those with high chlorine content, accumulate in the environment and through the trophic chain, especially in aquatic organisms and ichthyophagous birds in which cumulation factors of up to 1,000,000,000 may be reached. While chemical degradation of PCBs in the environment is negligible, photolysis, especially of compounds with high chlorine contents, or dechlorination to compounds with reduced chlorine contents are highly probable. Excretion and metabolism of PCBs was observed in certain higher animals. Compounds with low chlorine content are subject to microbial degradation.

75-1809. Norman, C. (Author address not given). **The little nipper who cost the South a fortune.** *Nature (London)* 255(5504): 94-95; 1975.

Problems associated with the use of mirex to eradicate the ants *Sollenopsis richteri* and *S. invicta* are discussed. The insects, called fire ants, come from South America and in 1918 established a colony in Mobile, Alabama. They have since invaded nine states, and despite expenditures of $115 million to control the ants, they expanded their territory to 126 million acres by 1969. Beginning in 1962 mirex was applied in very small amounts (1.7 g/A) dissolved in soybean oil and spread on corn cob grits. Because residues of mirex were found in crustaceans and other aquatic animals, the use of the pesticides was prohibited after 1972 in heavily wooded areas and near inland waters. Public hearings by the Environmental Protection Agency began in 1973. The Department of Agriculture announced it was withdrawing from the fire ant program in 1975 because of the EPA restrictions. The fire ant could be eliminated entirely with three applications of mirex in an 18-month period over the entire infested area. Since the Federal government spent about $1/A on the program in 1974, complete eradication would run into hundreds of millions of dollars.

75-1810. Boness, M. (Abt. Pflanzenschutz Anwendungstech./Biol. Forsch., Inst. Tierische Schaedlinge, Leverkusen, Germany). **Insektenpheromone und ihre Anwendungsmoeglichkeiten. [Insect hormones and possibilities for their use.]** *Naturwiss. Rundsch.* 26(12): 515-522; 1973. (141 references) (German)

Studies on the isolation, identification, synthesis, and field use of insect pheromones in insect control are reviewed. Disparlure (*cis*-7,8-epoxy-2-methyloctadecane), a synthetic pheromone of *Porthetria dispar*, proved to be efficient in the control of gypsy moth populations, which would be technically, economically, and ecologically impossible by means of trichlorfon. Phermones of *Argyrotaenia velutinana, Grapholita molesta, Zeiraphera diniana, Choristoneura rosaceana, Cryptophlebia leucotreta, Choristoneura fumiferana, Paralobesia viteana, Pyrausta (Ostrinia) nubilalis, Adoxphyes orana (Capua reticulana), Trogoderma granarium, Ceratitis capita, Dacus dorsalis,* and *Dacus curcubitae* were used for the control of the respective species more or less successfully in field tests.

75-1811. Shahid, M. (Dep. Entomol., Coll. Agric., Univ. Peshawar, Peshawar, India). **The integrated pest control.** *Pak. J. For.* 23(3): 221-226; 1973. (14 references)

The integrated approach to pest control is discussed and recommendations for achieving maximum and permanent control are made. The need for integrated control is due to the increase in number of secondary pests and the increased cost of control. Integrated pest control includes the development of means for controlling outbreaks of a particular pest without disturbing the balance of other pest species in that environment. Initially only chemical and biochemical controls were integrated, but other control measures were added such as release of sterile insects, use of resistant varieties, traps, and other cultural and physical methods. The insecticides must be extremely specific, selective in action, and have short residual effects. Systemic insecticides that will kill the pests and spare their natural enemies should be used. A granular form of insecticide is most desirable because it does not come in direct contact with the natural enemies of the pest. The minimum dose of insecticide that will kill the target species should be used. Environments can be modified to favor existing parasites and predators by providing them with better food and by protecting them against secondary parasitism, competition or antagonism, and dusts.

75-1812. Roy, N. K.; Mukerjee, S. K. (Div. Agric. Chem., Indian Agric. Res. Inst., New Delhi, India). **Suggestions on the development of pesticides in India.** *Pesticides* 9(1): 15-16; 1975. (8 references)

The pesticide industry will play an important role in the development of a safer and more selective pest control program in India. At present, relatively few pesticides are being manufactured in India and their production is, for the most part, based on foreign technology. To strengthen the research and development of pesticidal chemicals in India, the development activities must be divided into two major groups: the development of indigenous technology for common pesticides currently being imported and the development of new, safer, and more specific pesticides with reduced pollution potential. The development of analogues of certain botanicals, particularly pyrethrins, would be especially desirable. A search for entirely new toxophoric groups should be the aim of future synthetic chemists, and replacement of fungicides based on imported metals such as mercury and copper by new synthetic organic fungicides would be highly desirable. Research and development should also concentrate on the utilization of waste products such as neem, karanj, castor oil, and dill oil, and on the utilization of raw materials such as furfural, chloral, and BHC nonactive isomers.

75-1813. Sokolov, M. S.; Knyr, L. L.; Strekozov, B. P.; Agarkov, V. D.; Chubenko, A. P.; Kryzhko, B. A. (Inst. Agrochem. Soil Sci., Acad. Sci. USSR, Pushkino-na-Oke, USSR). **Povedeniye nekotorykh gerbitsidov v usloviyakh risovoy orositel'noy sistemy. [Behavior of some herbicides during rice irrigation.]** *Agrokhimiya (Moscow)* 3: 95-106; 1974. (22 references) (Russian)

The metabolism, sorption, migration, and persistence of 2,4-D, 2M-4C (MCPA), and propanil in irrigated rice fields were studied. Large quantities of metabolites, such as 2,4-dichlorophenol, 4-chloro-2-cresol, and 3,4-dichloroaniline were found in rice plants and in soil following herbicide application. Up to 90-95% of the herbicide residues disappeared from the water and soil in 5 to 15 days after application. The rate of degradation is independent of the initial dose. Herbicide residues were found in rice plants during the first month after application, while rice grains contained neither herbicide nor metabolite residues. The migration in chernozem-like meadow soil decreased in the order 2M-4C, 2,4-D, and propanil in inverse relation to their sorption. Most of the residues were localized in the upper 5 cm soil layer. Phytoplanktons were found to contain herbicide residues, which indicates that irrigation water from herbicide-treated rice fields should not be used for fish breeding without special precautionary measures.

75-1814. Luquet, F. M.; Goursaud, J.; Casalis, J. (Lab. Ind. Laitiere, E.N.S.I.A., Douai, France). **La pollution des laits humains francais par les residus de pesticides organochlores. [Contamination of human milk by organochlorine pesticide residues in France.]** *Aliment. Vie* 62(1): 40-69; 1974. (39 references) (French)

Results are presented of systematic analyses of organochlorine pesticide residues in human milk samples collected in France during 1971-1973. The average residue concentrations on fat basis were determined to be 0.98 mg/kg for hexachlorobenzene, 1.77 mg/kg for total BHC, 0.040 mg/kg for α-BHC, 1.67 mg/kg for β-BHC, 0.06 mg/kg for lindane, 0.28 mg/kg for heptachlor and heptachlor epoxide, 0.23 mg/kg for aldrin plus dieldrin, 2.4 mg/kg for *p,p'*-DDE, and 0.84 mg/kg for *p,p'*-DDT. The findings indicate high contamination level of human milk in France, with not a single sample satisfying the residue standards imposed on cow milk. Compared with the latter, the human milk samples contain 5 to 10 times more BHC, up to 100 times more DDT, 4 to 5 times more heptachlor and heptachlor epoxide, and 5 to 6 times more aldrin and dieldrin.

75-1815. Gregor, H.; Duschin, I.; Savin, G. (Author address not given). **Remanenta captanului si folpetului in struguri, must si vin in urma tratamentelor efectuate. [Persistence of captan and folpet in grapes, must, and wine following treatments.]** *An. Inst. Cercet. Prot. Acad. Stiinte Agric. Silvice* 9: 515-521; 1973. (7 references) (Romanian)

The persistence of captan and folpet in grapes, must, and wine was determined, and the effect of residues on must fermentation was investigated. Treatments applied 10-30 days prior to harvesting resulted in the accumulation of 1.5-11 ppm on grape berries. The time interval between treatment application and harvesting generally had a positive effect on the loss of toxicant. There was no residue accumulation in the variants receiving two and three treatments, as compared to those receiving a single treatment. The determination of residues present in the must showed values below 1 ppm. No correlation could be established between the residue amounts present on grapes and those determined in the must. The alcoholic fermentation of musts obtained from treated grapes showed that the initiation of the fermentation process was delayed by 5-12 days. The day after 5 ppm of captan were added to the must, the amount of selected ferments varying between 0.5 and 5 ml had an effect on the toxic deposit, which decreased as the yeast amount added to the must increased. Twelve days later, the fermentation process was not yet initiated even if the maximum amount of yeast was added. In 1 year old wines, captan and folpet residues were very low.

75-1816. Comer, S. W.; Staiff, D. C.; Armstrong, J. F.; Wolfe, H. R. (Pesticides Toxic Substances Effects Lab., Field Studies Sect., Wenatchee, WA 98801). **Exposure of workers to carbaryl.** *Bull. Environ. Contam. Toxicol.* 13(4): 385-391; 1975. (8 references)

Potential dermal and respiratory exposure to carbaryl and the urinary excretion of 1-naphthol were studied in workers involved in the formulation of 4% and 5% carbaryl dust and in spraymen operating tractor-drawn power air-blast equipment as they applied 0.045-0.06% carbaryl spray to fruit orchards. The formulating plant workers were subjected to greater potential dermal and respiratory exposure than the field workers; mean exposure values for formulating plant workers were 73.9 mg/hr dermally and 1.1 mg/hr by inhalation, the values being 59.0 mg/hr and 0.09 mg/hr, respectively, for the field workers. A major factor causing occasional high exposure values for formulating plant workers was malfunctioning of the bag filter spout mechanism, while wind was a major contributing factor for field workers. The highest potential exposure areas for formulating plant workers were the hands, forearms, and front of the body; for field worker, the shoulder areas and back of the neck received the greatest exposure. Among the formulating plant workers, urinary 1-naphthol levels indicated relatively high levels of carbaryl absorption in certain instances. The mean rate of excretion was 0.5 mg/hr, peak excretion occurring about 6 hr after exposure; this correpsonds to an absorption of 5.6 mg carbaryl during an 8 hr work day. The calculated total exposure would be 75 mg/hr. The calculated percent of toxic dose per hr of exposure would be 0.03% for formulating plant workers and 0.02% for spraymen. At these levels, concern about acute toxic effects in workmen would be minimal.

75-1817. Johnson, D. R.; Melquist, W. E.; Schroeder, G. J. (Det. Biol. Sci., Univ. Idaho, Moscow, ID 83843). **DDT and PCB levels in Lake Coeur d'Alene, Idaho, osprey eggs.** *Bull. Environ. Contam. Toxicol.* 13(4): 401-405; 1975. (11 references)

Between 1972 and 1973, individual osprey (*Pandion haliaetus*) eggs were collected from 11 clutches in the Lake Coeur d'Alene watershed. The levels of DDT and PCB in the homogenized contents and shells were determined by gas chromatography, and shell thickness was determined by micrometer measurement. DDE was found in concentrations of 1.8-15 ppm, along with lesser amounts of *p,p'*-DDD (TDE) and *p,p'*-DDT; PCB, probably Aroclor 1260, averaged 1.2 ppm. Total DDT residues were highest (mean 17.6 ppm) in eggs taken from clutches which eventually failed; DDT residues averaged 7.1 ppm in eggs from clutches which eventually fledged at least 1 young. There was no significant difference in eggshell thickness between eggs taken from successful and unsuccessful clutches, nor was there any significant difference in eggshelll thickness between eggs from successful clutches and 10 addled eggs collected from 7 clutches between 1970 and 1973. The sources of pesticide contamination in this osprey population are not entirely known, in that DDT has not been used extensively within the Coeur d'Alene watershed.

75-1818. Brown, J. R.; Chow, L. Y. (Inst. Environ. Studies, Univ. Toronto, Toronto, Ontario, Canada). **Comparative study of DDT and its derivatives in human blood samples in Norfolk County and Holland Marsh, Ontario.** *Bull. Environ. Contam. Toxicol.* 13(4): 483-488; 1975. (9 references)

The body burdens of DDT and its derivatives were compared in residents of Norfolk County and Holland Marsh, Ontario. Adipose tissues and blood samples obtained at autopsy and blood samples from living persons were analyzed by gas liquid chromatography. The mean values of total DDT in the adipose tissue and blood samples obtained at autopsy were 5.83 and 0.032 ppm, respectively; there was a significant correlation between total DDT in the fat and blood. The total DDT in the blood of the healthy residents of Norfolk County was higher than that in the blood of the Holland Marsh residents; the median values were 0.021 and 0.011 ppm in Norfolk County and Holland Marsh, respectively. There was no evidence of any adverse effect of DDT on the two populations. Although the pesticide has been used in large amounts in both locations, Norfolk County has primarily a sandy loam soil, while Holland Marsh has a muck type soil. Presumably, the applied DDT remained more firmly bound in the muck type soil than in the sandy loam soil.

75-1819. Haque, R.; Hansen, D. (Dep. Agric. Chem., Environ. Health Sci. Cent., Oregon State Univ., Corvallis, OR). **New colored chlorinated hydrocarbon-clay complexes.** *Bull. Environ. Contam. Toxicol.* 13(4): 497-500; 1975. (6 references)

Highly purified chlorinated hydrocarbons were refluxed in cyclohexane for 20 hr with a montmorillonite clay which had been ion exchanged with sodium, centrifuged, and spray dried. The resulting products were analyzed by electron spin resonance (e.s.r.). As the reaction between the clay and the various hydrocarbons progressed, the color of the clay changed, the color being highly dependent on the nature of the particular chlorinated hydrocarbon. In most cases, the e.s.r. signal was enhanced over the free electron value characteristic of montmorillonite in the complexes formed. The increase in signal intensity was probably due to chlorinated hydrocarbon free-radicals on the clay surface. The color of the complex and the intensity of the e.s.r. signal was also dependent on the humidity and pH of the clay. Exposure of a DDT-clay complex to air resulted in a further color change and the addition of 3 peaks to the e.s.r. signal; upon heating, the complex returned to its original color and the additional e.s.r. peaks disappeared. Methoxychlor, *p,p'*-DDT, (TDE) dicofol, *p,p'*-DDD, and 4,4'-dichlorobiphenyl produced strong increases in the montmorillonite e.s.r. signals; dieldrin, 4,4-dichlorobenzophenone, and *o,p'*-DDT produced small increases in the e.s.r. signals; and *p,p'*-DDE, *p,p*-DDA, and lindane produced no enhancement in the original signal. The colored complexes may represent an additional factor in describing the persistence and behavior of chlorinated hydrocarbons in the environment.

75-1820. Voerman, S.; Besemer, A. F. H. (Lab. Res. Insecticides, Wageningen, The Netherlands). **Persistence of dieldrin, lindane, and DDT in a light sandy soil and their uptake by grass.** *Bull. Environ. Contam. Toxicol.* 13(4): 501-505; 1975. (9 references)

Samples of grass and grass-roots which had been grown in a light sandy soil contaminated with DDT, lindane, and dieldrin were analyzed for pesticide residues using electron-capture gas chromatography. The soil had been treated with pesticides yearly during the period 1953-1968; the grass samples were taken in 1969 and 1973. The roots and leaves of ryegrass grown in the soil in 1973 were also analyzed. The results indicated that during the 4 years following the cessation of pesticide application, there were no significant decreases in the soil concentrations of dieldrin, *p,p'*-DDT, or *o,p'*-DDT. The *p,p'*-DDE concentrations doubled between 1969 and 1973, while the lindane residues decreased significantly during this period. Transport into lower soil layers was minor. The pesticide concentrations in the grass roots were 5-15 times higher than in the soil, but only relatively small quantities were found in the grass itself. The concentrations of *p,p'*-DDD (TDE) were also considerably higher in the grass roots than in the soil.

75-1821. Serat, W. F.; Mengle, D. C.; Anderson, H. P.; Kahn, E.; Bailey, J. B. (Community Studies Pesticides, State Dep. Health, Berkeley, CA 94704). **On the estimation of worker entry intervals into pesticide treated fields with**

and without the exposure of human subjects. *Bull. Environ. Contam. Toxicol.* 13(4): 506-512; 1975. (9 references)

Because of the inherent difficulties in fielding and maintaining crews of subjects to work pesticide-treated fields and because of the potential danger involved, it would greatly facilitate the establishment of safe entry intervals if they could be estimated without the need for human exposure in field studies. If a parameter could be established which would relate a function of toxicity to foliage pesticide level, the entry intervals could be estimated without the need for human exposure for those pesticides whose toxicity is dependent upon producing a common physiological effect and for which the relative toxicity values as determined on a test system parallel those found in man. Three organic phosphate pesticides for which field data on human exposure exists were shown to give approximate relative correlations in their toxic effects on an experimental animal and on man. From such information entry intervals expected to produce a given degree of cholinesterase inhibition in farm workers could be calculated either with or without the involvement of human subjects. The developement of the necessary expressions follows from a first order loss for residues on crops and for plasma cholinesterase levels as a function of the total potential pesticide exposure.

75-1822. Jackson, M. D.; Wright, C. G. (Pesticide Residue Res. Lab., North Carolina State Univ., Raleigh, NC 27607). **Diazinon and chlorpyrofis residues in food after insecticidal treatment in rooms.** *Bull. Environ. Contam. Toxicol.* 13(5): 593-595; 1975. (4 references)

Diazinon and chloropyrifos were applied as aerosol-type crack and crevice sprays at the recommended and twice the recommended concentrations to dormitory rooms equipped with window fans. Before and 4.5 hr after insecticide application, commercially processed, sliced potatoes in china dishes and heated TV dinners in their aluminum trays were placed in the rooms. After 0.5 hr, the potatoes and dinners were removed from the rooms and analyzed for residue concentrations using gas chromatography. No detectable residues of diazinon or chlorpyrifos were found in either potatoes or TV dinners or chlorpyrifos were found in either potatoes or TV dinners placed in the rooms 4.5 hr after pesticide application. A person consuming a TV dinner containing the highest residue levels found would ingest insignificant amounts of pesticide.

75-1823. Grover, R. (Res. Stn., Agric. Can., Regina, Saskatchewan, Canada). **Herbicide entry into the atmospheric environment.** *Chem. Can.* 26(7): 36-38; 1974.

The drift of herbicide during application and losses by volatility which may occur both during and immediately following an application are discussed. Atmospheric monitoring data collected over the past decade in western Canada shows that the high volatile butyl esters constitute the predominant form of 2,4-D in the air, being detected during about 50% of the days the air was sampled. The levels were between 0.01 to 1 $\mu g/m^3$ of air and seldom exceeded 5 $\mu g/m^3$. Under conventional field spraying conditions using ground sprayers, the magnitude of the droplet drift from any of the formulations is of the order of 5% or less of the material emitted, whereas the vapor losses may be as high as 30% from the high volatile butyl esters within an hour or so of the application. The off-target vapor drift can be reduced by the use of the low volatile iso-ocytl esters or eliminated by the use of the amine salts which are non-volatile at normal temperatures.

75-1824. Kirchhoff, J. (Abt. Phytopathol. Pflanzenchutz, Univ. Hohenheim, Stuttgart-Hohenheim, Germany). **Versuche zum Verhalten von Parathionrueckstaenden bei der Verarbeitung von Kirschen und Aepfeln. [Experiments concerning the changes in parathion residues during processing of cherries and apples.]** *Deut. Lebensm.-Rundsch.* 72(2): 64-67; 1975. (13 references) (German)

Cherries and apples containing parathion residues of (3.8 ppm and 1.35 ppm, respectively) were processed into preserved fruit, jam, puree, juice, and jelly according to home preparative methods. The decrease of residue was associated with dilution processes and the separation of components rich in residue but not to degradation of the compound. No degradation of the pesticide was observed during storage of the products over several months at 13—16°C.

75-1825. Kutz, F. W.; Yobs, A. R.; Johnson, W. G.; Wiersma, G. G. (Ecol. Monitoring Br., Tech. Serv. Div., Off. Pestic. Programs, EPA, Washington, DC 20460). **Mirex residues in human adipose tissue.** *Environ. Entomol.* 3(5): 882-884; 1974. (5 references)

The discovery of mirex residues in human adipose tissue by the National Human Monitoring Program is reported. Samples of tissue with positive mirex residues from April 1971 to April 1972 came from four males and two females. Both Caucasians and Negroes were found to be positive. Four ranged in age from 57-66, one was 43, one was 10 years old. There was no relationship between the finding of mirex residues and occupational patterns. Five of the six patients came from rural environments. The residues came from routes other than direct pesticide usage.

75-1826. Bennington, S. L.; Connors, P. G.; Connors, C. W.; Risebrough, R. W. (Dep. Zool., Univ. Canterbury, Christchurch, New Zealand). **Patterns of chlorinated hydrocarbon contamination in New Zealand sub-antarctic and coastal marine birds.** *Environ. Pollut.* 8(2): 135-147; 1975. (20 references)

Eggs and tissues from seabirds (*Phalacrocorax carunculatus, Sternastriata, Eudyptula minor, Pachyptila turtur, Pelecanoides urinatrix, Larus novaehollandiae*

scopulinus, Pterodroma inexpectata, Puffinus griseus, Eudyptes crestatus, Sterna vittata, Diomedea exulans, and *Falco novaeseelandiae*) breeding on the coast of South Island, New Zealand, the Snares Islands, and the Auckland Islands in the sub-Antarctic were examined for chlorinated hydrocarbon contamination. Higher levels of both industrial and agricultural compounds in the birds from the New Zealand coastal area reflected local contamination. In the sub-Antarctic, DDE residues were several times lower and PCB levels were lower by 1-2 orders of magnitude than in species occupying comparable ecological niches at Amchitka on a comparable latitude in the North Pacific. Concentrations of DDE in an unhatched egg of a New Zealand falcon from the sub-Antarctic were sufficiently high, on the basis of comparison with related species, to be associated with significant shell thinning.

75-1827. Engst, R.; Knoll, R. (Author address not given). **Zur Anreicherung von Rueckstaender chlorierter Kohlenwasserstoffe in der Nahrungskette. [Concentration of residues of chlorinated hydrocarbons in the nutritional chain.]** *Ernaehrungsforschung* 18(1): 1-8; 1973. (22 references) (German)

The accumulation of organochlorine pesticide, and especially DDT residues in the trophic chains is discussed and facts are presented. Plants, soil, and water are the initial links of the trophic chain, followed by aquatic organisms, predatory birds, and domestic animals. High contents of DDT and DDE were found in river water along orchards with intense use of DDT. Liver samples from *Haliaetus albicella* specimens contained up to 250 ppm DDT, and up to 1,600 ppm DDT were found in the body fat. The maximum allowable DDT level in milk has been set at 0.5 ppm in view of the rather high DDT concentrations in milk. Both DDT and its metabolites, such as *p,p'*-DDT, *p,p'*-DDE, and DDE were detected in adults, babies, and even fetuses, as well as in human milk in which the total DDT level amounted to 8.2 ppm.

75-1828. Anonymous. **DDT residues in food decline.** *FDA Consum.* 9(4): 22-23; 1975.

The 1973 survey of pesticides in food made by the Food and Drug Administration is discussed. A decline was noted in all the food products surveyed except eggs, where DDT residues remained constant and fluid whole milk, where there was a slight increase. The study involved 8388 samples of which 3013 were imports. For chlorinated pesticides, the samples showed overall violative residues on or in 2.1% of domestic produces and 1.8% of imported products and, for organophosphorus pesticides, 1.1% of domestic products and 3.5% of imported products. The relative frequency of dieldrin residue occurrence declined slightly in raw agricultural products but increased slightly in dairy products, eggs, and fish. Polychlorinated biphenyl residues were not among those most frequently found except in fish, where their frequency ratio was exceeded only by the DDT related residues. Organophosphorus pesticide residue occurrence was not significant in dairy products, eggs, and fish, but there was a slight shift toward more residues in raw agricultural products. Combined endosulfan compounds, toxaphene, and carbaryl increased in relative frequency. BHC occurrence increased in domestic milk, dairy products, and fish, and remains the most frequently encountered residue in imported cheese.

75-1829. Taylor, R. W. D. (Tropical Stored Products Cent., Ministry of Overseas Development, Slough, Berks., England). **Fumigation of individual sacks of grain using methallyl chloride for control of maize weevil.** *Inst. Pest Contr.* 17(1): 4-8; 1975. (14 references)

Methallyl chloride is suggested as suitable for insack fumigation of grain stored in individual sacks rather than in bulk containers. Polyethylene-lined sacks were prepared with 65 kg yellow maize at 13% moisture, mixed with 1 kg of maize inoculated with *Sitophilus zemais*. Sacks were fumigated at dosages of 7 ml, 10 ml, 15 ml, and 20 ml of methallyl chloride to 66 kg maize. After 7 days at 27°C and 70% relative humidity, the contents of the sacks were examined. Methallyl chloride could be detected in the bottom corners of the sack within a few minutes of dosing; after 4 hr the concentration was about the same at all locations within the sacks. Methallyl chloride is not lost rapidly from fumigated grain, but the residue falls to below 10 ppm after an airing period of about 1 week. Grinding and cooking fumigated maize reduced the residue level considerably. Maize fumigated and subsequently eaten by humans after cooking is likely to contain very small residues of methallyl chloride. The few tests in which grain fumigated with methallyl chloride fed to test animals showed no reduction in their growth rate.

75-1830. Metcalf, R. L; Lu, P. Y.; Bowlus, S. (Dep. Entomol. and Inst. Environ. Stud., Univ. Illinois, Urbana-Champaign, IL 61801). **Degradation and environmental fate of 1 - (2,6 - difluorobenzoyl) - 3 - (4 - chlorophenyl)urea.** *J. Agric. Food Chem.* 23(3): 359-364; 1975. (15 references)

Radiolabeled preparations of the insect growth regulator PH-6040 were evaluated for degradation in a laboratory model ecosystem and after exposure to sheep microsomes, *Pseudomonas*, soil, and ultraviolet light. The parent compounds was found to be moderately stable but was not highly concentrated through food chains or by direct absorption from water. The degradative pathways were almost entirely through cleavage between the carbonyl and amide groups of the urea bridge to give 2,6-difluorobenzamide and 2,6-difluorobenzoic acid, 4-chlorophenylurea, and 4-chloroaniline. (Author abstract reprinted by permission of the American Chemical Society)

75-1831. Schooley D. A.;Creswell, K. M.; Staiger, L. E.; Quistad, G. B. (Zoecon Corp. Res. Lab., Palo Alto, CA

94304). **Environmental degradation of the insect growth regulator isopropyl (2*E*, 4*E*)11 - methoxy - 3,7,11 - trimethyl - 2,4 - dodecadienoate (methoprene). IV. Soil metabolism.** *J. Agric. Food Chem.* 23(3): 369-373; 1975. (24 references)

Metabolism of isopropyl (2*E*,4*E*) - 11 - methoxy - 3,7,11 - trimethyl - 2,4 - dodecadienoate, a new insect growth regulator (common name, methoprene; trademark, Altosid), was studied on soils as a function of time, under various conditions. On aerobic sandy loam, [5-^{14}C]methoprene showed an initial half-life of about 10 days at a surface treatment rate of 1 kg/ha; decomposition was much slower on autoclaved soil. Only small amounts of nonpolar metabolites were isolated, including the hydroxy ester resulting from *O*-demethylation (0.7% of the applied dose). Over 50% of applied dose was converted to $^{14}CO_2$. Radioactivity from [5-^{14}C]methoprene incorporated into humic acid, fulvic acid, and humin fractions of sandy loam. This data indicates rapid and extensive breakdown of methoprene in soils. (Author abstract reprinted by permission of the American Chemical Society)

75-1832. Nilles, G. P.; Zabik, M. J.* (Dep. Entomol. and Chem., Michigan State Univ., East Lansing, MI 48824). **Photochemistry of bioactive compounds. Multiphase photodegradation and mass spectral analysis of basagran.** *J. Agric. Food Chem.* 23(3): 410-415; 1975. (18 references)

The natural sunlight and simulated sunlight photolyses of basagran (3 - isopropyl - 1*H* - 2,1,3 - benzothiadiazin - (4) - 3*H* - one 2,2 - dioxide) have been studied in aqueous solution, as a thin film, and on soil. The mass spectra of the major photoproducts are interpreted in terms of their structures. The major routes of photoalteration of this new herbicide were found to be oxidative dimerization and nonconcerted loss of sulfur dioxide. A new formation of the quinazolin - 3*H* - 4 - one ring system is reported as well as the use of "neutralized" Caro's acid in the oxidation of an aromatic amine to the corresponding nitroso compound. (Author abstract reprinted by permission of the American Chemical Society)

75-1833. Bielorai, R.; Alumot, E.* (Agric. Res. Organ., Volcani Cent., Bet Dagan, Israel). **The temperature effect on fumigant desorption from cereal grain.** *J. Agric. Food Chem.* 23(3): 426-429; 1975. (7 references)

The more rapid desorption of fumigant residues from whole cereal grain at low (14-17°) rather than at high (30-37°) temperature was confirmed with several fumigants by two methods of analysis. The unchanged fumigant residues seem to be present in the fumigated grain in two forms: loosely and firmly bound. The desorption of the firmly bound residues from grain fumigated at room temperature is at least twice as fast at low rather than at high temperature of airing. Fumigation temperatures affect the relative amounts of the residues: at lower temperatures lower levels of firmly bound residues are present. This temperature effect may be responsible for faster desorption in winter than in summer as noted in field experiments. The low-temperature effect was abolished by grinding the grain and was not due to the fat fraction of the fumigated materials. It seems that the intact grain structure is responsible for this effect. (Author abstract reprinted by permission of the American Chemical Society)

75-1834. Aharonson, N.; Kafkafi, U. (Pestic. Chem. and Residue Res. Lab., Div. Soil Chem. and Plant Nutr., Agric. Res. Organ., Volcani Cent., Bet-Dagan, Israel). **Adsorption of benzimidazole fungicides on montmorillonite and kaolinite clay surfaces.** *J. Agric. Food Chem.* 23(3): 434-437; 1975. (16 references)

The effect of pH on the adsorption by montmorillonite and kaolinite clays of three benzimidazole derivatives, thiabendazole (TBZ), 2-benzimidazole carbamic acid methyl ester (MBC), and benzimidazole was investigated. Adsorption isotherms for TBZ and MBC on Ca and Na Wyoming bentonite showed that an increase in the acidity of the suspension resulted in a significant increase in the adsorption of the fungicide to the clay. The shape of the adsorption curves on Ca-bentonite at various pH values resembled simple titration curves with a midpoint 2.5-3.5 pH units above the p*K*a of the respective fungicides. The midpoint for TBZ on Na-kaolinite was in the vicinity of its p*K*a. The fungicide MBC did not adsorb on kaolinite clay even at pH 2. These findings suggested adsorption on mineral clay surfaces by protonation of these basic organic molecules. Protonation and adsorption were not directly related to the basicity of the molecule. An increase in $CaCl_2$ concentration resulted in a decrease in the adsorption of the fungicides. Both fungicides were adsorbed in aqueous solutions on MgO and not adsorbed on Al_2O_3. (Author abstract reprinted by permission of the American Chemical Society)

75-1835. Carringer, R. D.; Weber, J. B.*; Monaco, T. J. (Crop Sci. and Hortic. Sci. Dep., North Carolina State Univ., Raleigh, NC 27607). **Adsorption-desorption of selected pesticides by organic matter and montmorillonite.** *J. Agric. Food Chem.* 23(3): 568-572; 1975. (19 references)

Adsorption-desorption studies were conducted with the following pesticides: asulam (methyl sulfanilyl carbamate), butralin [4 - (1,1 - dimethylethyl) - *N* - (1 - methylpropyl) - 2,6 - dinitrobenzenamine], dicamba (3,6 - dichloro - *o* - anisic acid), fluometuron [1,1 - dimethyl - 3 - (α,α,α - trifluoro - *m* - tolyl) - urea], leptophos [*O* - (4 - bromo - 2,5 - dichlorophenyl) *O* - methyl phenylphosphonothiote], methazole [2 - (3,4 - dichlorophenyl) - 4 - methyl - 1,2,4 - oxadiazolidine - 3,5 - dione], norflurazon [4 - chloro - 5 - (methylamino) - 2 - (α,α,α, - trifluoro - *m* - tolyl) - 3(2*H*) - pyridazinone], oxidiazon [2 - *tert* - butyl - 4 - (2,4 - dichloro - 5 - isopropoxyphenyl) - Δ^2 - 1,3,4 - oxadiazolin - 5 - one], profluralin [*N* - (cyclopropylmethyl) - α,α,α - trifluro - 2,6 - dinitro - *N* - propyl - *p* - toluidine], prometryn [2,4 - bis(isopropylamino - 6 - (methylthio) - *s* - triazine], and TH6040 [1 - (4 - chlorophenyl) - 3 - (2,5 - difluorobenzoyl)urea]. Adsorents

used were soil organic matter, Ca-saturated montmorillonite. Desorbing solutions were deionized water and 1 *N* $CaCl_2$. Adsorption of prometryn by both adsorbents primarily by cation exchange. Adsorption by organic matter of asulam and the nonionic compounds was in the reverse order of their water solubilities. This suggests that the mechanism of adsorption was hydrophobic bonding. (Author abstract reprinted by permission of the American Chemical Society).

75-1836. Murray, D. S.; Santelmann, P. W.*; Davidson, J. M. (Dep. Agron., Oklahoma State Univ., Stillwater, OK 74074). **Comparative adsorption, desorption, and mobility of dipropetryn and prometryn in soil.** *J. Agric. Food Chem.* 23(3): 578-582; 1975. (17 references)

Adsorption-desorption isotherms with dipropetryn [2-(ethylthio)-4,6-bis(isopropylamino)-*s*-triazine] and prometryn [2,4-bis(isopropylamino)-6-(methylthio)-*s*-triazine] were determined using six adsorbent materials possessing a wide range in cation exchange capacities (CEC), percent organic matter (OM), clay levels, and pH values. Dipropetryn and prometryn adsorption-desorption isotherms showed increasing adsorption with increasing clay content, cation exchange capacity, and organic matter levels, and decreasing pH values. With all adsorbents, more dipropetryn was adsorbed than prometryn. After eight successive desorption extractions, more dipropetryn than prometryn remained adsorbed. Soil thin-layer chromatography was used to evaluate herbicide mobility. Fluometuron [1,1-dimethyl-3-(α,α,α-trifluoro-*m*-tolyl)urea], a more mobile herbicide, was included as a standard. Dipropetryn showed less movement in the soil than prometryn or fluometuron, with fluometuron showing the greatest movement. As CEC, percent OM, and clay content decreased, herbicide mobility increased for all three herbicides. Soil mobility of dipropetryn and prometryn correlated well with adsorption-desorption isotherm parameters. (Author abstract reprinted by permission of the American Chemical Society)

75-1837. Suzuki, Y.; Sasaki, S.; Sugaya, H. (Inst. Rural Med., Hiraga Gen. Hosp., Aomori, Japan). [**Residual amount of organochlorine pesticides in human body—report of 1973.**] *Akita-Ken Noson Igakkai Zasshi (Akita Prefect. J. Rural Med.)* 21(2): 1-4; 1975. (1 reference) (Japanese)

Organochlorine pesticide residues such as α-, β-, and γ-BHC, DDE, *p,p'*-DDT, *o,p'*-DDT, and dieldrin were determined in 19 specimens of mother's milk, 23 specimens of adipose tissue, and 11 specimens of human internal organs obtained within one year after April 1, 1973. The BHC and DDT isomers and dieldrin were detected in almost all specimens. ω-BHC and minute amounts of the α-and γ-isomers were found in every specimen. DDE and detected in all specimens, DDT isomers were detected only slightly if at all. Dieldrin showed a tendency to decrease. Residual amounts of organochlorine were larger in milk from primiparas than in that of multiparas. Residues of organochlorine in adipose tissues of cancer patients were smaller than those in other patients. The residual amount in greater omental fat was greater than that in subcutaneous fat. The amount of total oganochlorine pesticide residues decreased in the order of kidney, liver, spleen and brain. The residual amounts showed an increasing tendency from 1970 to 1972; however, in 1973 they showed a decreasing tendency.

75-1838. Valenzuela Calahorro, C.; Navarrete Guijosa, A.; Lopez Gonzalez, J. de D. (Dep. Quim. Inorgan., Fac. Ciencias, Univ. Granada, Granada, Spain). **Retencion de DDT y DDE sobre montmorillonita homoionica acida y sodica.** [**Retention of DDT and DDE homoionic acid and sodium montmorillonite.**] *An. Quim.* 71(2): 149-157; 1975. (13 references) (Spanish)

A study of the process of DDT and DDE molecule retention on homoionic acid and sodium montmorillonite is presented. Solutions of 0.1 m*M* DDT and DDE in cyclohexane were used at 10°C and 20°C. In a first retention phase, the accessible surface of the M-H to DDT molecules was determined from the retention. Values found at 10°C and 20°C were 1.3 m^2/g and 0.6 m^2/g, respectively. The accessible surface of the M-Na to DDT molecules was 1.2 m^2/g at 10°C and 20°C. At the same time, the maximum surface of M-H and M-Na samples accessible to DDT and DDE, under the same conditions, have been determined. The differential heats and entropies corresponding to the retention process were also determined.

75-1839. Rappel, A.; Waiblinger, W. (Landesuntersuchungsamt fuer das Gesundheitswesen Suedbayern, Fachbereich Chemie, Munich, Germany). **Zur Kontamination von Muttermilch mit Rueckstaenden chlorieter Kohlenwasserstoffe.** [**Contamination of human breast milk with chlorinated hydrocarbon residues.**] *Deut. Med. Wochenschr.* 100(6): 228-238; 1975. (9 references) (German)

Residues of DDT and its metabolite DDE were found in 136 of 137 samples of human breast milk studies between June 1973 and January 1974. When averaged, quantities of DDE were double those of DDT. DDD (TDE) was found in 73 samples at the same time, and can be formed during DDT metabolism. Other chlorinated hydrocarbons (hexachlorobenzene, lindane (γ-BHC), technical BHC, and heptachlor epoxide) were found less frequently. Only one sample was within acceptable limits for residues in cows' milk and milk products. ADI values for DDT in adults, suggested by WHO, were exceeded fourfold on the average and 16-fold in the highest value. The not infrequent contamination by polychlorinated biphenyls, industrial products which are very similar to DDT in toxic and physico-chemical properties, is also alarming.

75-1840. Yamasue, Y. (North Carolina State Univ., Raleigh, NC). **Foliar effects on tobacco (*Nicotiana tabacum* L.) of benefin vaporizing from soils.** *Diss. Abstr. Int.* 35(10): 4734B-4735B; 1975.

Benefin is a selective, soil-applied, pre-emergence herbicide used on a variety of crops including tobacco. Several studies were undertaken on the problem of foliar injury to tobacco by the herbicide vapors arising from treated soils. In closed vapor exposure chambers, foliar injury was caused by vapors of technical grade benefin (more than 99% purity) and its commercial formulation, but not by the emulsifier alone. Rates of the herbicide incorporated into soil ranged from 0.84 to 6.72 kg/ha. The lowest rate was sufficient to induce the foliar injury. There was little or no injury on roots at any rate. Both the herbicide concentration in the air and severity of the foliar injury increased as the herbicide rate and soil moisture increased, and as the soil organic matter content decreased. When benefin was incorporated into a loamy sand, there was a higher herbicide concentration in air above the soil and more severe foliar injury than from incorporation into a sandy loam or clay loam soil. Concentrations of the herbicide were 0.28-0.85 ng/ml 24 hr after incorporation into a sandy loam soil at 0.84 to 3.36 kg/ha. Air sample analyses by GLC-ECD showed no compounds other than the parent benefin. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 75-7715.)

75-1841. Yang, M. S. (Univ. California, Davis, CA). **Processes of adsorption, desorption, degradation, volatilization, and movement of *O,O*-diethyl *O*-*p*-nitrophenol phosphorothioate (parathion) in soils.** *Diss. Abstr. Int.* 35(10): 4735B; 1975.

Studies of processes and influential factors affecting parathion loss from soil were undertaken to develop a mathematical model for predicting parathion distribution in the soil column under evaporative conditions. The exothermic nature of parathion adsorption on soil was partially caused by the solubility-temperature interaction. Soil organic matter content had a greater effect on adsorption depending on the nature of the adsorptive surface. Biological degradation was the major factor for parathion dissipation in soil and the initial rapid degradation followed first-order kinetics. Soil water content affected the degradation rate and a low level of parathion persisted in the soil for some time. The adsorption of parathion by soil reduced the vapor density in soils. Parathion concentration and soil moisture content also affected volatilization and there appears to be a critical moisture level for each soil below which the volatilization decreases rapidly. Degradation was the major parathion sink in a soil column. Volatilization constituted only a small fraction of parathion losses. Henry's law can be used to predict the pesticide behavior in a soil-water system. The predicted parathion distributions are in agreement with the experimental results. Parameters measured in separated batch-type experiments are valid for predicting the transient parathion distribution. Parathion volatilization fluxes constituted only 15.6% and 22.2% of the parathion flux moved by mass flow in Hanford sandy loam and Panoche clay loam, respectively. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 75-8634.)

75-1842. Baldwin, F. L. (Oklahoma State Univ., Stillwater, OK). **Movement of fluometuron and prometryn across and through the soil.** *Diss. Abstr. Int.* 35(10): 4746B; 1975.

Specially constructed field plots were used to study the influence of environmental factors (rainfall frequency, antecedent soil moisture, and subsequent rainfall) on herbicide movement across and through the soil. In general, prometryn losses by runoff were greater than fluometuron losses. However, in all experiments where the herbicides were put on a dry soil, prometryn and fluometuron losses were 0.5% or less of that applied. The first aliquot of runoff leaving the plot contained the highest concentration of herbicide, and the sediment carried a much higher concentration of herbicide than did the runoff water. In terms of the total herbicide lost, however, most of the herbicide was lost in the water portion of the runoff because sediment removal from the plots was small. Fluometuron was leached into the 5-10 cm soil depth, and low concentrations were found at the 10-20 cm depth. However, prometryn was never detected below 5 cm in the soil. Antecedent soil moisture had a greater influence on runoff losses than did rainfall frequency, although frequency did appear to influence fluometuron leaching into the profile. The highest runoff losses of both herbicides occurred when they were applied to a wet soil. In addition, the highest losses resulted from the first runoff-producing rainfall. One month subsequent to application, neither fluometuron nor prometryn could be detected in the runoff waters. After 48 days, fluometuron and prometryn dissipation was occurring, but both herbicides remained in concentrations phytotoxic to oats. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 75-8709.)

75-1843. Brockman, F. E. (Cornell Univ., Ithaca, NY). **Factors affecting activity and selectivity of methazole in seedling alfalfa.** *Diss. Abstr. Int.* 35(10): 4747B; 1975.

A series of experiments was performed to elucidate herbicide-soil-plant relationships that might affect the performance of methazole following observations of erratic field results. Organic matter accounted for 60-80% of the variability in response of alfalfa and several weed species to methazole across five soil types in a growth chamber experiment. The active components of methazole appears to be 3-(3,4-dichlorophenyl)-1-methylurea (DCPMU), which was detected as a soil metabolite. An apparatus was constructed to apply simulated rainfall for herbicide leaching studies; it has the capability of uniformly delivering water to a large number of soil columns. In growth chamber studies using the apparatus, 28% of applied methazole was recovered as parent compound, 53% as DCPMU, and 1.2% as 3-(3,4-dichlorophenyl) urea. There was little movement of methazole or metabolites below

6.35 mm. Selectivity in seedling alfalfa appears to be due to localization of the herbicide in a narrow zone at the soil surface where little is taken up by alfalfa but a sufficient amount is absorbed by weed species to arrest their growth. Carbaryl inhibited metabolism of methazole in cotton leaf discs. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 75-8583.)

75-1844. Murray, D. S. (Oklahoma State Univ., Stillwater, OK). **Environmental and soil factors affecting the dissipation, phytotoxicity and mobility of dipropetryn.** *Diss. Abstr. Int.* 35(10): 4751B; 1975.

Greenhouse and field studies were performed on soil and plant factors affecting toxicity of prometryn and dipropetryn. Soil incubation studies determined the effects of soil temperature and moisture levels on dissipation of dipropetryn and prometryn. Sorption isotherms were prepared, and soil thin-layer chromatography was performed to determine herbicide mobility. Increased dissipation of both dipropetryn and prometryn was caused by higher incubation temperatures, higher incubation soil moisture levels and increased time. No difference in dissipation was noted between the herbicides. More dipropetryn phytotoxicity was noted in a drier soil when soil moisture levels were established by watering intervals. Soil moisture levels established by minimum moisture oscillations resulted in no differential dipropetryn phytotoxicity. Higher soil temperature levels caused increased dipropetryn phytotoxicity. Dipropetryn and prometryn adsorption-desorption isotherms with six adsorbent materials showed increasing adsorption with increasing clay content, cation exchange capacity and organic matter levels and decreasing pH values. With all adsorbents, more dipropetryn was adsorbed than prometryn. After eight successive desorption extractions, more dipropetryn also remained adsorbed. Soil mobility of dipropetryn and prometryn correlated well with adsorption-desorption isotherms. With all adsorbents, dipropetryn showed the least mobility. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 75-8844.)

75-1845. Cocisiu, M.; Aizicovici, H.; Nistor, C. (Inst. Sanat. Publica Cercet. Med., Iasi, Romania). **Impregnarea oganismului uman cu DDT si HCH in unele zone din tara noastra. [Human contamination with DDT and HCH in some areas in our country.]** *Igiena* 24(1): 31-35; 1975. (24 references) (Romanian)

The investigation of the impregnation of the human organism with organochlorine pesticides is reported. 240 Samples of adipose tissue of men from 12 countries were analyzed. DDT, DDE, and BHC were found in all samples. Highest total DDT values were found in samples from Mures County (17.94 ppm), Ialomita (15.04 ppm), Iasi (14.85 ppm), and Satu Mare (14.50 ppm). Highest values found relating to the impregnation of the human organism with BHC were in samples from Iasi County (9.0 ppm), Mures (8.32 ppm), and Dolj (8.12). All samples averaged 12.38 ppm for DDT and 4.76 ppm for BHC. This indicated a high level of impregnation in Romania relative to the data provided from other nations.

75-1846. Kovaleva, Ye. S.; Talanov, G. A. (All-Union Sci. Res. Inst. Vet. Hyg., USSR). **Dinamaka ostatkov dilora v zelenykh rasteniyakh, korneklubneplodakh i pochve. [Dynamics of dilor residues in green plants, root crops, and soil.]** *Khim. Sel. Khoz.* 12(1): 40-42; 1974. (4 references) (Russian)

The residue dynamics of dilor were studied in the soil and in clover, alfalfa, vetch, corn, oat, potato, and beet plants. Treatment was applied as aqueous emulsion at rates of 1 and 2 kg/ha before sowing or on young plants. The highest dilor concentratios in the plants were between 0.75 and 0.96 mg/kg 10 days after the pesticide was applied on the plants. The residue levels were between 0.01 and 0.19 mg/kg 90 days after treatment. In fields treated before sowing, dilor translocated into the stems and leaves. The concentrations in such plants were not greater than 0.05 mg/kg, and 0.12 mg/kg were found in the skin of beets. Dilor persisted in the soil for 100 days.

75-1847. Kavolyunayte, I. A.; Shpokauksas, A. K. (Vokesk Branch Office, Lithuanian Sci. Res. Inst. Agriculture, Vokesk, USSR). **Issledovaniye dinamiki ostatkov prometrina v rasteniyakh kartofelya i v poche. [Prometryn residues in potatoes and soil.]** *Khim. Sel. Khoz.* 12(1): 54-57; 1974. (5 references) (Russian)

Prometryn residues in potato plants treated with prometryn at rates of 2 and 4 kg/ha as well as in the soil were studied. Prometryn was detected in the potato tops only. The residue levels ranged from zero to 0.08 mg/kg shortly before harvesting. The prometryn residues in the upper 20 cm soil layer ranged between 0.01 and 0.64 mg/kg before harvesting. Prometryn exerted a weak effect on the soil microflora. Its effect was most pronounced on bacteria and actinomycetes, and weakest on molds and sporiferous bacteria.

75-1848. Gelineo-Lukatela, M. S. (Inst. Chem. Fac. Sci., Belgrade, Yugoslavia). **Kinetische Methode der drei Abtastwerte zur Bestimmung der anfaenglichen Konzentration und der Geschwindigkeitskonstante bei Reaktionen erster und zweiter Ordnung. [A three sample kinetic method for evaluation of the initial concentration and rate constant in first-and second-order reactions.]** *Mikrochim. Acta* 1(1): 25-33; 1975. (2 references) (German)

A simple and rapid kinetic method for determination of initial concentrations and rate constants is proposed. Three samples taken in the course of the reaction form the basis of the method. If the sampling rate is uniform, the time of the first sampling and the sampling interval can be chosen at random. Formulas are derived for the first- and

second-order reactions which can be highly useful when determination of both the initial and final portions of the reaction process by direct measurement is impossible. The proposed method produces fairly accurate estimates of the basic reaction parameters with relative error below 5%. The rate constant of the analyzed reaction is approximately the total sampling time required for an evaluation. The method was applied to the hydrolysis of dimethyl dichlorovinyl phosphate (dichlorvos), an insecticide.

75-1849. Solly, S. R. B.; Shanks, V. (Wallaceville Anim. Res. Cent., Res. Div., Upper Hutt, New Zealand). **Polychlorinated biphenyls and organochlorine pesticides in human fat in New Zealand.** *N. Z. J. Sci.* 17(4): 535-544; 1974. (19 references)

Organochlorine residues were determined in 51 human fat samples obtained at autopsy in Lower Hutt, New Zealand in 1973. All samples contained DDE, DDT, hexachlorobenzene, and polychlorinated biphenyls; 96% contained dieldrin (0.02 ppm or more), 37% contained β-BHC (0.20 ppm or more); 20% contained TDE (0.02 ppm or more), and 22% contained lindane (0.05 ppm or more). The results were analyzed statistically to compare mean levels in males with those in females using age as a covariate. Residues of heptachlorobiphenyls were significantly higher in males than in females. Significant differences between sexes were not observed for other organochlorine compounds. Residues of DDT and polychlorobiphenyls increased with age, while residues of lindane decreased with age ($P < 0.05$, $P < 0.01$, and $P < 0.01$, respectively). Gas chromatograms of human fat extracts were qualitatively similar to chromatograms obtained from extracts of pig and beef fat environmentally contaminated with polychlorinated biphenyls.

75-1850. Beitz, H.; Banasiak, U.; Bergner, U.; Czyrnia, W. (Inst. Pflanzenschutzforsch. Kleinmachnow, Biol. Zentralanst. Berlin, Landwirtschaftswiss. DDR, Berlin, DDR). **Zum Rueckstandsverhalten von Ethephon in Winterroggen. [Ethephon residue dynamics in winter rye.]** *Nachrichtenbl. Pflanzenschutzdienst. DDR* 28(12): 252-255; 1974. (2 references) (German)

The gas chromatographic analysis of ethephon contained in the new stalk stabilizer camposan is described. Study of harvested rye grains revealed an average of 0.043, 0.086, and 0.078 ppm ethephon residue at dosages of 2.5, 2.0, and 2.5 kg ethephon per hectare, respectively. This is no hazard to consumers because of a 0.5 ppm tolerance limit. In rye straw, at dosages of 1.0, 1.5, and 1.0 kg/ha, ethephon residues were 0.49, 0.39, and 0.58 ppm, respectively. Investigations showed that the active principle was rapidly decomposed and that only 1.5 ppm could be traced in the material after 21 days. Further investigations are suggested.

75-1851. Luquet, F. M.; Goursaud, J.; Casalis, J. (Ecole Natl. Super. Ind. Agric. Aliment., Douai Cedex, France). **La pollution des laits humains francais par les residus d'insecticides organochlores. [Pollution of human milk in France with organochlorine insecticide residues.]** *Pathol. Biol.* 23(1): 45-59; 1975. (16 references) (French)

Marked pollution by organochlorine insecticides was revealed in a two-year study involving monthly analysis of milk mixtures from ten French human milk banks. Observed averages were hexachlorocyclohexane (BHC) hexachlorobenzene, 2.75 mg/kg of pure fat; DDT and derivatives 3.24 mg/kg fat; heptachlor epoxide, 0.28 mg/kg and dieldrin, 0.23 mg/kg. The more important insecticides, with average values, were β-BHC (1.67), hexachlorobenzene (0.98), and dichlorodiphenyldichloroethylene (DDE) (2.40). All milks were greatly polluted throughout the year. There were qualitative differences relative to the geographic location of the banks. Hexachlorocyclohexane (BHC) was the primary pollutant south of the Loire River, and heptachlor and dieldrin were dominant north of the Seine. Studies performed in Lille found 50% reduction in pollution between 1970 and 1973. Probable routes of contamination are poor or improper use of home insecticides and contaminated human food.

75-1852. Raynal, G.; Ferrari, F. (Chaire de Botanique et Pathologie Vegetale, I.N.A., Paris, France). **Remanence et action sur la microflore fongique du benomyl utilise en incorporation a un sol. [Residue and action of benomyl on fungi in soil.]** *Phytiat.-Phytopharm.* 22(3): 259-272; 1973. (7 references) (French)

The persistence of benomyl and its action on soil fungi were studied in natural soil under laboratory conditions. The semiquantitative determination of benomyl in soil samples was done by a growth inhibition test using *Penicillium cyclopium*. Benomyl was added to the soil in concentrations of 1 and 100 ppm. The soil to which 100 ppm benomyl was added still contained 8 ppm residue after 6 months. Benomyl did not seem to set off the fungal equilibrium of the soil, and it appeared to have fungistatic rather than fungicidal action. Many fungus species, such as *Phycomycetes* and *Stilbellaceae*, were resistant to benomyl in 1 ppm concentration, and all species that were resistant to 10 ppm were also resistant to 100 ppm.

75-1853. Hertel, W. (Seestrasse 11, 1000 Berlin 65, Germany). **Kontamination von Getreide und Getredeerzeugnissen. [Contamination of cereals and their products.]** *Qual. Plant. Pl. Foods Hum. Nutr.* 23(1/3); 269-279; 1973. (16 references) (German)

Problems of the contamination of cereals and cereal products with radioactive isotopes, automotive exhaust compounds, and pesticides are discussed. Maximum allowable concentrations of hydrocyanic acid, lindane, malathion, methyl bromide, and phosphine in cereals are set at 6 ppm, 0.1 ppm, 3 ppm, 50 ppm, and 0.05 ppm, respectively, in West Germany. The use of lindane in cereal cultures has been prohibited since 1971. The corresponding tolerances in milled products are 6 ppm for

hydrocyanic acid, 0.03 ppm for lindane, 1 ppm for malathion, 8 ppm for piperonyl butoxide, and 3 ppm for pyrethrin. Zero tolerance is imposed on methyl bromide and hydrogen phosphide. Milling tests demonstrated that most of the lindane residue is localized in the outer layers of the grains, while light flour types contain little lindane. Slow diffusion of lindane into the center of the grains during storage for many years was observed. Baking causes hardly any reduction in the lindane residue level. Wet milling for starch production results in considerable decrease in the lindane residue level in rice and corn. Malathion residues diminish rather rapidly to levels below the tolerance level. Hydrocyanic acid, methyl bromide, and phosphine can be efficiently removal from cereal grains by aspiration and washing.

75-1854. Mukherjee, G.; Mukherjee, A. K.; Roy, B. R. (Central Food Lab., Calcutta, India). **Stability of malathion in water.** *Res. Ind.* 19(4): 170; 1974. (1 reference)

One ml of an acetone solution of malathion was added to flasks containing 100 ml of tap water (pH 8), distilled water (pH 6), or alkaline distilled water (pH about 7). The samples were analyzed periodically over the following 3 weeks using thin-layer chromatography. During this period, the malathion concentration in the flasks decreased significantly, possibly due to hydrolysis in the admixed water solutions. The loss was most rapid in the tap water, in which the residue level fell to 0 within 1 week. Malathion disappears more rapidly in aqueous solution than does parathion.

75-1855. Mukherjee, G.; Chakraborty, J.; Mukherjee, A. K.; Roy, B. R. (Central Food Lab., Calcutta, India). **Rate of dissipation of DDT, lindane and malathion from certain vegetables.** *Res. Ind.* 19(4): 171; 1974. (7 references)

The rate of dissipation of DDT, lindane, and malathion from potatoes, cabbage, cauliflower, and spinach was studied. The vegetables were treated with 5 mg of pesticide and the residue levels measured using thin-layer chromatography 3 hr to 5 days later. The residue loss was rapid over the first 24-30 hr, particularly during the first 3 hr. Malathion and DDT dissipated most rapidly from the potatoes, while lindane dissipated most rapidly from the potatoes and cauliflower. Since at least 5 days were required for the residue concentrations to fall below the tolerance limits, consumption of treated vegetables during this period should be avoided.

75-1856. Anonymous. [**The status quo of pollution by pesticides and its countermeasures.**] *Saga-Ken Kasei-Bu (Status Quo of Environmental Pollution and its Countermeasures in Saga Prefecture)*, Saga Prefectural Office, 1974, p. 464-480. (Japanese)

The results of pesticide residue determinations were tabulated and comments given. The total BHC residues in market milk and raw milk showed a decreasing trend. Average levels in market milk were 0.05 (1972), 0.019 (1973), and 0.009 (1974) ppm; and in raw milk 0.218 (1972), 0.0319 (1973) and 0.012 (1974) ppm. The β-BHC content in mothers' milk was on the average 0.18 (max. 0.46 and min. 0.02) ppm in 1974. The total DDT content in mother's milk averaged 0.04 (max. 0.12 and min. 0.0068) ppm. The residues of designated pesticides in foods were all below the limits set by the Ministry of Health and Welfare, with some instances of detection in agricultural crops.

75-1857. Gamar, Y.; Mustafa, M. A. (Dep. Biochem. Soil Sci. Fac. Agric., Univ. Khartoum, Sudan). **Adsorption and desorption of diquat ^{2}+ on arid-zone soils.** *Soil. Sci.* 119(4): 2290-295; 1975. (18 references)

The adsorption and desorption of diquat and paraquat on 8 arid-zone soils were studied. Adsorption of the 2 organic cations on the soils conformed quite well with the linear form of the Langmuir equation. Practically, the adsorption maximum of a given soil for diquat may be considered similar to that of paraquat. The adsorption maxima obtained for the 8 soils ranged from 17 to 47 me/100 g. The CEC (cation exchange capacity) of a soil was found to be the determining factor of diquat ($r = 0.946$) and paraquat ($r = 0.932$) adsorption. The strong adsorption capacities of the soil ranged from 9 to either 23 or 21 mg/100 g for diquat or paraquat, respectively. This corresponds to a range of 1930 to 4500 tons/acre-in. for diquat or paraquat, respectively. It was therefore concluded that these herbicides do not constitute any residue hazard. Less than 1 percent and about 50 percent of the adsorbed organic cations could be released with water and 1 *M* $BaCl_2$, respectively, from the 2 soils considered.

75-1858. Rajaram, K. P.; Sethunathan, N. (Dep. Soil Microbiol., Cent. Rice Res. Inst., Cuttack, Orissa, India). **Effect of organic sources on the degradation of parathion in flooded alluvial soil.** *Soil Sci.* 119(4): 296-300; 1975. (7 references)

The effect of organic sources on the degradation of parathion via nitro group reduction and hydrolysis in flooded alluvial soil is reported. Parathion residues in the soils were extracted with solvent and separated by thin-layer chromatography. Parathion was assayed colorimetrically after its conversion to *p*-nitrophenol by alkaline hydrolysis. Generally, organic sources accelerated the nitro group reduction of parathion. The degradation followed the order glucose ⟩ rice straw ⟩ algal crust ⟩ farmyard manure ⟩ unamended. However, in soils inoculated with parathion-hydrolyzing enrichment culture, organic amendments inhibited the hydrolysis. The rate of hydrolysis in different amendments followed a reverse order of that for nitro group reduction. Isotope experiments revealed more rapid conversion of parathion to aminoparathion and an unidentified metabolite in rice straw amended soil than in unamended soil. These metabolites were also formed rapidly in soils amended with other organic sources. In unamended soil, a polar unidentified

metabolite was detected. The common practice of incorporating organic materials in rice culture tends to influence the detoxication of parathion in the rice soil environment depending on the pathway involved.

75-1859. Horowitz, M.; Hulin, N.; Blumenfeld, T. (Agric. Res. Org., Newe Ya'ar Exp. Stn., Haifa, Israel). **Behaviour and persistence of trifluralin in soil.** *Weed Res.* 14(4): 213-220; 1974. (26 references)

The growth response of sorghum to trifluralin, on various soils and soil mixtures, was significantly correlated with organic matter (ranging from < 0.1% to 20.4%) but not with clay content (ranging from 3% to 63%). However, in soils with a similar, low organic matter content, the activity of trifluralin increased with increasing clay content. No correlation was found between phytotoxicity of trifluralin and lime content of soils. The persistence of trifluralin incorporated in soil was examined by repeated reseedings of sorghum. Phytotoxicity lasted longer in soil dried and mixed at each interval between seedings than in soil left undisturbed; after 2 months about 50% of the original 4 ppm trifluralin remained in undisturbed soil vs. 60% in repeatedly mixed soil. The rate of degradation, after 2 months of incubation at 50% field capacity, increased with temperatures from 10° to 40°C; the concentration of trifluralin required for a given growth reduction was approximately eight times greater after incubation at 40° than at 10°C. (Author abstract by permission)

75-1860. Horowitz, M.; Herzlinger, G. (Agric. Res. Org., Newe Ya'ar Exp. Stn., Haifa, Israel). **Soil conditions affecting the dissipation of diuron, fluometuron and propham from the soil surface.** *Weed Res.* 14(4): 257-259; 1974. (13 references)

Diuron and fluometuron at 0.6 kg/ha and propham at 4 kg/ha were sprayed on the soil surface and left exposed for 2 weeks to hot and sunny weather. All three herbicides were completely deactivated when sprayed on wet soil; on air-dry soil a smaller but appreciable loss of diuron and propham was recorded. Shallow incorporation after spraying on dry soil greatly reduced the dissipation. A light irrigation after spraying or after 1 week of exposure increased the loss of the herbicide. (Author abstract by permission)

75-1861. Suffling, R.; Smith, D. W.; Sirons, G. (Dep. Bot. Genet., Univ. Guelph, Guelph, Ontario, Canada). **Lateral loss of picloram and 2,4-D from a forest podsol during rainstorms.** *Weed Res.* 14(5): 301-304; 1974. (22 references)

Losses of picloram (4-amino-3,5,6-trichloropicolinic acid as the triisopropanolamine salt) and 2,4-D (2,4-dichlorophenoxyacetic acid as the triisopropanolamine salt) from a Tordon 101-sprayed podsol in a Great Lakes forest clearcut were measured for one year following spraying. Less than 1.0% of the picloram and much less than 0.1% of the 2,4-D applied was lost during seven runoff events. Even an event less than 24 hr after spraying failed to release significant quantities of either herbicide. (Author abstract by permission)

75-1862. Brandl, E. (Inst. Milchwirtschaft und Mikrobiol., Hochsch. Bodenkult., Vienna, Austria). **Zum Problem von Fremdstoffrueckstaenden in Milch und Milchprodukten. [Problems associated with residues in milk and milk products.]** *Wien. Tieraerztl. Monatsschr.* 60(10): 305-312; 1973. (23 references) (German)

A survey is made of pesticides, antibiotics, and disinfectants as potential and actual contaminants of milk and milk products, and the behavior of such contaminants during technological processing is described. Organochlorine pesticides, such as DDT, chlordane, methoxychlor, lindane, heptachlor, aldrin, dieldrin, toxaphene, and endosulfan present in milk and milk products originate from sanitation treatment, and principally from feed ingested. Therefore, the use of organochlorine pesticides on permanent forage crops is prohibited in Austria. Organochlorine pesticides accumulate in body fat, and are excreted especially in milk as long as there are residue reserves in the body. While pasteurization causes little reduction of the pesticide residue level in milk, condensation, distillation, sterilization, and spray drying are usually highly effective in residue abatement. Residue analysis of milk and milk products sampled in different European countries revealed that contamination is due mainly to DDT and lindane, and partly to aldrin, dieldrin, heptachlor, and heptachlor epoxide.

75-1863. DeScisciolo, S. (Washington-Lee High School, Arlington, VA). **The analysis of tap water samples for DDT and its isomers through use of the gas chromatograph.** *J. Wash. Acad. Sci.* 65(1): 15-16; 1975.

Experiments were conducted to determine whether Washington area water treatment plants had an efficient method of ridding the raw water of any DDT, TDE, or DDT derived compounds. Samples were collected both before and after treatment at the Lorton Treatment Facilities on the Occoquan River. Evidence showed the presence of DDT (.1765 ppb), TDE (.2745 ppb), and DDT derived compounds. (.1565 ppb) before treatment. After treatment no evidence of DDT, TDE, or DDT derived compounds was found. Samples were also obtained from the Dalecarlia Water Plant on the Potomac River, but the results are as yet incomplete.

See also 75-1890 75-1892 75-1917 75-2013 75-2023 75-2026

75-1864. Mayer, B. W.; Schlackman, N. (St. Christopher's Hosp. Child., Philadelphia, PA). **Organophsophates—a pediatric hazard.** *Am. Fam. Physician* 11(5): 121-124; 1975.

Hazards associated with the use of organophosphorus pesticides are discussed and diagnosis and treatment of toxicity are outlined. Organophosphates act as anticholinesterases since they irreversibly bind both true cholinesterase found in the red blood cell and at the motor end plate and pseudocholinesterase found in the plasma. Signs of toxicity are overactivity of the parasympathetic nervous system, nausea, vomiting, diarrhea, sweating, abdominal cramps, and copious secretions. Large doses may cause sustained depolarization of the motor end plate, leading to muscular paralysis. Death may ensue from respiratory failure. The extensive and often careless use of insecticides, fungicides, and pesticides makes organophosphates a particular pediatric hazard. Atropine and pralidoxime chloride are effective for therapy. Atropine (1-2 mg intravenously or intramuscularly) is given to block the action of overwhelming amounts of acetylcholine present because of acetylcholinesterase (AChE) inhibition. Pralidoxime breaks the fixed bond between the organophosphate and AChE. The AChE is then free to hydrolyze acetylcholine and to allow muscle function and tone to return to normal.

75-1865. Ganendran, A. (Univ. Malaya, Pantai Valley, Kuala Lumpur, Malaysia). **Organophosphate insecticide poisoning and its management.** *Anaesth. Intens. Care* 2(4): 361-358; 1974. (28 references)

As the organophosphate insecticides have become widely used in agriculture and in home gardening, cases of accidental and intentional poisoning have increased. Almost all of these insecticides are potent cholinesterase inhibitors, and signs of poisoning are attributable to the accumulation of acetylcholine. The local absorption of these compounds from the conjuctiva, upper respiratory tract, and skin following exposure to the aerosol or dust used in agricultural work produces mild symptoms and is rarely of consequence except in accidents due to careless handling. The severe type of poisoning is generally caused by ingestion of the compound(s); accumulation of large amounts of acetylcholine is fatal if not antagonized rapidly by large and continuous doses of atropine and respiratory support. Although pyridine-2-aldoxime methiodide (2-PAM) has been reported successful in treating parathion poisoning, it does not appear to be of similar value in treating the intoxication caused by other organophosphorus insecticides.

75-1866. Black, A. M. S. (St. Vincent's Hosp., Sydney, Australia). **Self poisoning with dieldrin: a case report and pharmacokinetic discussion.** *Anaesth. Intens. Care* 2(4): 369-374; 1974. (21 references)

A healthy 21-year-old man swallowed 9 gm of dieldrin as a 15% solution in toluene. Gastric lavage was performed which retrieved negligible amounts of dieldrin. Mannitol was given by nasogastric tube and metaclopramide and diazepam were given i.v. Profound muscular paralysis with pancuronium bromide was maintained for 48 hr to control convulsions; this treatment was supplemented with phenobarbitone, phenytoin, and diazepam injections. Practolol and propranolol were given for continuing tachycardia and hypertension, and general supportive treatment consisted of intermittent positive pressure ventilation, maintenance of fluid and electrolyte balance, surface cooling, and gastric aspiration. The patient gained full consciousness within 5 days, but disturbances in short-term memory and persistent headaches continued to occur for several weeks. There was some hepatic damage caused by the dieldrin, but there were no lung abnormalities or renal damage. Repeated measurements of serum and adipose tissue dieldrin levels indicated that the patient may have absorbed only a small fraction of the ingested dieldrin. Chronic intoxication with dieldrin produces clinical symptoms due to central nervous system stimulation; deaths have generally been attributed to asphyxia.

75-1867. Plestina, R. (Inst. Med. Res. and Occup. Health, Yugoslav Acad. Sci. and Arts, Zagreb, Yugoslavia). **Toksicni plucni edem i promjene vaskularnog permeabiliteta. [Toxic lung edema and vascular permeability changes.]** *Arh. Hig. Rada Toksikol.* 25(1): 67-97; 1974. (222 references) (Serbo-Croatian)

Lung edema of chemical origin is reviewed. Relevant details concerning mammalian lung structure and function are presented. Since an increase in vascular permeability is a regular finding in the edema of chemical origin, its changes are considered in more detail. The structure of lung vascular bed and the role of lymphatics are also discussed. Lung edema caused by naturally occurring toxins such as pyrrolizidine alkaloids, furanoterpens or bacterial toxins, is described. A number of cases of human accidental poisoning (edematous gases, narcotics, drugs, or pesticides) accompanied by lung edema are reviewed. Special attention has been paid to experimental lung edema. Edemogenic properties of ANTU, adrenaline, ammonium salts, aloxan, or turpentine are discussed in further detail.

75-1868. Jirasek, L; Kalensky, J.; Kubec, K.; Pazderova, J.; Lukas, E. **[Acne chlorina, porphyria cutanea tarda, and other manifestations of general intoxication during the manufacture of herbicides. II.]** *Cesk. Dermatol.* 49(3): 145-157; 1974. (40 references) (Czech)

General examinations of 55 out of 80 subjects who suffered intoxication during the manufacture of sodium pentachlorophenolate and the sodium salt of the butyl ester of 2,4,5-trichlorophenoxyacetic acid are described. Seventy-six of the patients suffered from chloracne and exhibited porphyria cutanea tarda; disorders of the metabolism of fats, porphyrins, carbohydrates, and plasma proteins; hepatic lesions; lesions of the peripheral

neurons; and a neurasthenic syndrome and organic affections. The majority of patients suffered from psychic disorders of various intensities, most frequently from a severe neurasthenic syndrome with vegetative symptoms. The disease was progressive during the first years; during subsequent years the dermatological symptoms improved, as did the porphyric disease and neurologic disorders. The cause of the intoxication was 2,3,6,7-tetrachlorodibenzodioxin, which is formed as a byproduct during alkaline hydrolysis of tetrachlorobenzene to sodium trichlorophenolate at elevated temperature and pressure.

75-1869. Spear, R. C.; Jenkins, D. L.; Milby, T. H. (Univ. California, Berkeley, CA 94720). **Pesticide residues and field workers.** *Environ. Sci. Technol.* 9(4): 308-313; 1975.

Reported incidents of worker poisoning from exposure to organophosphorus pesticides are briefly reviewed. Toxic effects of these insecticides in man are due largely to their ability to inhibit the enzyme cholinesterase. Treatment of poisoning cases ranges from simple removal from exposure for very mild cases to provision of very rigorous supportive and antidotal measures in severe cases. Because they are readily absorbed through the skin, as well as by ingestion and inhalation, these pesticides present a particular hazard to agricultural workers who engage in mixing, loading, and applying the concentrated materials. There is a greater number of workers exposed to the residues than to the concentrated pesticides. These workers are often migrants thus not candidates for traditional forms of occupational health surveillance which are more common for workers who apply pesticides. Attempts have been made to determine the safe reentry intervals for the protection of agricultural and forest workers. Environmental factors, factors defining the exposure mechanism, and toxicological processes are considered in establishing these guidelines.

75-1870. Vale, J. A.; Scott, G. W. (Guy's Hosp., London SEl 9RT, England). **Organophosphorus poisoning.** *Guy's Hosp. Rep.* 123(13): 13-25; 1974. (24 references)

The incidence, routes of absorption, clinical features, diagnosis, and treatment of organophosphorus poisoning are reviewed. The incidence of organophosphorous insecticide poisoning varies considerably throughout the world. During 17 yr in Japan there were 19,000 cases of organophosphorus poisoning reported resulting in more than 9000 deaths. In contrast, in Great Britain over a 17 yr period, there were only five deaths, and at least three of these followed deliberate suicide attempts. The main routes of absorption are through the skin and the respiratory and gastrointestinal tracts. The manifestations of organophosphate poisoning are due to the accumulation of acetylcholine at the cholinergic synapses and include: muscarinic effects, nicotinic effects, and central nervous system effects. The time interval between acute exposure and the onset of symptoms varies with the route and degree of exposure. Inhibition of cholinesterase activity is the most specific test for systemic absorption of an organophosphorus compound.

75-1871. Lauwerys, R.; Lavenne, F. (Univ. Catholique de Louvain, Louvain, Belgium). **Precis de toxicologie industrielle et des intoxications professionelles. [Survey of industrial toxicology and occupational intoxications.]** *Editions J. Duculot, S. A., Gembloux, Belgium. 1972, 609 p.* (936 references) (French)

Aimed at physicans specializing in occupational medicine, this treatise contains a general survey of the principles of toxicologic investigation and summaries of recent findings on occupational intoxication by substances of various classes. The survey includes basic principles of industrial toxicology, mechanisms of toxic action, toxicant metabolism, toxicant interaction, and methods of limiting exposures to chemicals in industry. In the second part, the chemical characteristics, intoxication symptoms, prevention and treatment of poisoning, and existing Belgian legislation are described for principal classes of industrial toxicants. The "pesticides" chapter contains sections on insecticides, rodenticides, herbicides, and fungicides and indications concerning general protective measures for pesticide workers as well as Belgian pesticides legislation. The chapter on irritating gases also contains information on some compounds used as agricultural fumigants. Final chapters deal with respiratory protection equipment, cancers of occupational origin, radiation hazards, toxic coma (liver damage), and general principles of prevention.

75-1872. Demozay, D.; Vincent, V. (Cent. Rech. Dargoire, Societe Pepro, France). **Secret industriel et Centres anti-poisons. [Industrial secrecy and anti-poison centers.]** *Eur. J. Toxicol.* 6: 266-274; 1973. (French)

General problems and conflicts of industrial secrecy and toxicological information to be provided for anti-poison centers are discussed. In most cases, chemical plants are reluctant to divulge the composition of their chemical products to the anti-poison center for fear of adverse publicity in connection with frequent accidents, for fear of competition, or for fear of the possible withdrawal of official approval by the Homologation Commission to which data is furnished by the anti-poison centers. In many cases, toxicological data on the active agent and adjuvants is unknown even if the composition is known, especially in the case of new products, and generic and standard chemical names may not be available for new subtances for several years after they are launched. The compulsory homologation of pesticides is performed by an independent Commission whose procedures are secret, and whose report on products to be homologated is sent solely to the applicant.

75-1873. Mogilner, B. M.; Freeman, J. S.; Blashar, Y.; Pincus, F. E. (Dep. Pediatr., Kaplan Hosp., Barzilai Med.

Cent., Ashkelon, Israel). **Reye's syndrome in three Israeli children. Possible relationship to warfarin toxicity.** *Isr. J. Med. Sci.* 10(9): 1117-1125; 1974. (41 references)

Fatal cases of Reye's syndrome are presented which occurred in 3 children (2 boys and 1 girl, aged 2-3 yr). In 2 of the cases, warfarin toxicity is implicated. Four days prior to hospital admission, the 3 yr old girl had ingested a large quantity of colored granules which she had found by the road on her way to kindergarten. Abdominal pain and vomiting started the following day and continued up to admission. The ingested product was a commercial preparation of warfarin used as a rodenticide. Warfarin was found in the urine and blood. The three yr old boy had eaten grass of an unknown kind growing near his home, 3 days prior to hospitalization. Vomiting occurred shortly after ingestion. Reye's syndrome was diagnosed but despite efforts to save the child, he died. Significant amounts of warfarin were found in the urine and also in autopsy samples of liver and kidney tissue. The third child was from the same village as the second, and although Reye's syndrome was diagnosed, no toxicological studies were performed. These children all appeared well developed and well nourished. In these cases the neurological picture and the severe vomiting of Reye's syndrome appeared together. Gastrointestinal bleeding was a prominent feature and respiratory disturbances developed. Laboratory studies on admission showed mild hypoglycemia in only the second case. In the first case there was a striking hypoglycorrhachia despite a normal blood glucose level. Liver function was disturbed. These cases suggest more than a coincidental association between warfarin toxicity and Reye's syndrome.

75-1874. Farrell, R. K.; Bell, T. G.; Padgett, G. A. (Pullman, WA 99163). **Toxicity of flea collars.** *J. Amer. Vet. Med. Assoc.* 166(11): 1054; 1975.

It is reported in a Letter-to-the-Editor that dichlorvos flea collars have a morbid and lethal effect on some cats. This effect is particularly pronounced under dry and hot environmental conditions. It is urged that owners remove collars from animals showing signs of flea-collar toxicity. Many veterinarians recognize the neurotropic signs of ataxia and depression in cats wearing flea collars. It is stated that animals have died while being protected from fleas which were no problem in the first place, but which commercial advertising have made prominent in the minds of pet owners to the point where any animal that scratches is suspected of having fleas.

75-1875. Seppalainen, A. M.; Hakkinen, I. (Inst. Occup. Health, Helsinki, Finland). **Electrophysiological findings in diphenyl poisoning.** *J. Neurol. Neurosurg. Psychiat.* 38(3): 248-252; 1975. (11 references)

The fungistatic agent diphenyl (biphenyl) caused fatal poisoning with signs of neurotoxicity in a worker in a Finnish paper mill. This initiated a neurophysiological study of 24 workers (1 woman and 23 men) occupationally exposed to diphenyl. Ten men showed EEG abnormalities which, while non-specific, were compatible with generalized cerebral disturbance. The abnormalities persisted on re-examination 1 and 2 yr later. Nine subjects had EMG abnormalities; 7 also exhibited fibrillations in some muscles. One subject showed a long rhythmic series of fasciculations similar to the spontaneous activity described in infantile spinal muscular atrophy. Nerve conduction velocity, especially that of slower motor fibers, was reduced in several cases. Electroneuromyographic abnormalities also persisted on re-examination. Although diphenyl is considered a comparatively safe chemical, it showed evidence of neurotoxicity when workers were exposed to concentrations in excess of the presently accepted threshold limit of 1 mg/m^3. The average concentrations measured in the air at various work places varied from 0.6 to 123.0 mg/m^3. Electrophysiological methods should be applied for the early detection of occupational hazards.

75-1876. Hartz, W. P.; Swencicki, R. E. (Standard Oil Co., Richmond, CA 94804). **Keratitis on exposure to dimethyl phosphorochloridothionate (DMPCT).** *J. Occup. Med.* 17(5): 335-336; 1975. (2 references)

The effects of dimethyl phosphorochloridothionate (DMPCT, an insecticide production intermediate) on the eyes of 6 workers who were accidentally exposed while working in a pilot plant are reported. All the victims were males, aged 22-58 yr. The duration of exposure was unknown in 4 cases and was about 15 min and 4 hr in the other 2. Severe eye irritation and swelling of eyelids were noted in all exposed workers. Only one worker had an associated nasal congestion. Exposure did not cause immediate eye discomfort. Time intervals of 4 to 12 hr were noted between exposure and onset of symptoms which consisted of eye irritations, lacrimation, and light sensitivity. The reason for this delay may be due to the chemistry of DMPCT; in the presence of moisture DMPCT slowly decomposes to form hydrochloric acid. Examination with fluorescein stain and a magnifying glass did not show staining in 5 cases. Only slit lamp examination revealed fine puncture staining of the cornea (punctate keratitis). Treatment with antibiotic and steriod ophthalmological preparations, as well as patching of the eyes, resulted in complete healing of the punctate keratitis with no impairment of the visual acuity. No lung involvement was noted in these 6 cases.

75-1877. Pesticides Sect. (Agric. Chem. Inspect. Stn., Tokyo, Japan). [**Criteria for delaying application for registration of agricultural chemicals in view of their toxicity and persistency. Part 4.**] *Noyaku Kagaku (J. Pestic. Sci.)* 2(4): 192; 1975. (Japanese)

According to notice No. 161 (Dec. 23, 1974) of the Japan Environment Agency, criteria for delaying application for registration of four pesticides were recently established. Residues of propanil (3,4-dichloropropionanilide)

on/in rice, fruits, and tuber crops such as potatoes must not exceed 0.1 ppm. Prometryne (2-methylthio-4,6-bis(isopropylamino)*s*-triazine) on/in rice, wheat, barley, cereals, vegetables, and legumes must not exceed 0.05 ppm. Binapacryl (2-*sec*-butyl-4,6-dinitrophenyl-3,3-dimethylacrylate) on/in fruits must not exceed 0.05 ppm. Tolerances for benomyl (methyl-1-(butylcarbamoyl)-2-benzimidazole carbamate) on/in fruits, vegetables, legumes, and beetroot are 0.5-0.8 ppm. These standards should be taken as tolerances for the pesticide residues on crops when residue standards based on the food hygiene law have not yet been established. In addition, the residual standard of chlorpropham (isopropyl *N*-(3-chlorophenyl) carbamate) of not more than 0.05 ppm was extended from fruits and vegetables to fruits, vegetables, tuber crops such as potatoes, legumes, and beet root.

75-1878. Fujita, K. (Dep. Ophthalmol., Saku Gen. Hosp., Usuda, Nagano, Japan). [**Keratitis and conjunctivitis due to pesticides.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(1): 16-18; 1975. (8 references) (Japanese)

Eleven cases of keratitis and conjunctivitis all with complications due to pesticides are reported. Four injuries were caused by paraquat dichloride, 2 by tetrachlorophthalide, and one each by *o-sec*-butylphenyl methylcarbamate (BPMC), pentachloronitrobenzene (PCNB), dichlorvos, blasticidin-S plus phenyl mercury acetate, and an unknown pesticide. A case caused by paraquat dichloride is described in detail. The keratitis symptoms were more pronounced than those of conjunctivitis in all 4 cases by paraquat dichloride and the periods for healing were longer, 2-6 wk, than the cases by other pesticides, all however without any sequelae. The case caused by the methylcarbamate seems to be the first one reported. It is recommended that in all cases of pesticides splashed into the eyes, the eyes should be flushed copiously as soon as possible. Fortunately, no instance of blindness has been reported as a result of these poisonings.

75-1879. Popa, N.; Gabriela, B.; Dragan, L.; Nicola, A.; Mutean, F.; Bulicrea, R. (Lab. Clin, Reg. Hosp., Sibiu, Romania). **Modificarea activitatii pseudocholinesterazei serice in cursul expunerii la insecticide organo-fosforice.** [**Changes in serum pseudocholinesterase during exposure to organophosphorus pesticides.**] *Clujul. Med.* 47(3): 519-522; 1974. (7 references) (Romanian)

An investigation of the inhibition of pseudocholinesterase activity and the decrease in enzyme activity in agricultural workers using organophosphate pesticides is presented. A study of 55 laborers showed that repeated exposure to small, non-toxic doses of insecticides produces a significant decrease in pseudocholinesterase activity. This indicates the insufficient use of protection methods, and suggests that an accidential intake of a large dose could have drastic effects by inactivating a large proportion of the enzyme. Investigation of the mechanisms of enzyme synthesis in various pathological conditions is suggested.

75-1880. Hopmann, G.; Wanke, H. (Inn. Abt., St.-Marien-Hosp., Muelheim, Germany). **Hoechstdosierte Atropinbehandlung bei schwerer Alkylphosphatvergiftung.** [**Maxium dose atropine treatment in severe organophosphate poisoning.**] *Dtsch. Med. Wochenschr.* 99(42): 2106-2108; 1974. (4 references) (German)

Atropine in extremely high doses (maximally 0.5 mg every 20 sec. for a total of 11442.5 mg or 22885 ampules) was used to treat an unusually severe organophosphate poisoning. In such a severe poisoning these high doses produce no side effects or disadvantages and are likely to be lifesaving. On the thirteenth day, respiratory and cardiac relapse occurred (possibly due to a too rapid breakdown of atropine) which was only counteracted by a maximal atropine dosage. Clinical criteria, particularly continuous monitoring of the pupillary reaction, were not sufficient for recognizing the onset of the relapse. Cholinesterase activity proved to be a very useful indicator of this potential danger. Repeated enzyme estimations are urged during the treatment of organophosphate poisoning.

75-1881. Doroshenko, G. V. (I. P. Pavlov Med. Inst., USSR). **Gigiyenicheskaya khararakteristika uslovii truda i zdorov'ya rabotayushchikh pri primenenii khompleksa pestitsidov v sadovodstve.** [**Hygienic characteristics of work conditions and health status of persons handling a complex of pesticides in gardening.**] *Gig. Tr. Prof. Zabol.* 19(2): 12-14; 1975. (Russian)

Garden spraying with dinitro-*o*-cresol (DNOC), nitrofen, and a mixture consisting of carbophos (malathion), zineb, and efirsulfonate (ovex) was characterized by insufficient mechanization of preparatory operations, sometimes resulted in air levels exceeding the maximum permissible concentrations (by 3 to 5 times) of the pesticides under study, and often included a work day of 9 or 10 hours. In 46 workers using nitrofen and a mixture of pesticides (carbophos, trichlorfon, zineb; or carbophos, zineb, efirsulfonate) and 32 workers using dinitro-*o*-creosol and the above-mentioned mixtures, the altered blood characteristics included reduced hemoglobin levels and leucocyte counts. Blood cholinesterase activity was lowered, erythrocyte count was reduced, and catalase and transaminase levels were altered. These changes were most pronounced in workers using dinitro-*o*-creosol. Recommendations are made for the improvement of work conditions.

75-1882. Durneva, Z. N. (Inst. Ind. Hyg. and Occup. Dis., Akad. Med. Sci., Moscow, USSR). **Kharakteristike mozgovoi gemodinamiki i reaktivnosti sosudov v klinike toksicheskoi entsefalopatii.** [**On characteristics of cerebral hemodynamics and reactivity of the vessels in the clinical**

picture of toxic encephalopathy.] *Gig. Tr. Prof. Zabol.* 19(2): 27-31; 1975. (7 references) (Russian)

Seventy-seven patients clinically treated, from 2 to 10 times, for toxic encephalopathy or encephalopolyneuritis developed from sustained chronic intoxication with neurotropic poisons (carbon disulfide, manganese, mercury, dimethylformamide, chlorinated hydrocarbons, etc.) were examined. Rheoencephalographic findings show characteristic hemodynamic disturbances in patients with toxic encephalopathy, as follows: increased arterial and venous tone, reduced intensity of the pulse filling in the basins of the external and internal carotids (especially in the basin of the vertebro-basilar system), and hyperreactivity of cerebral vessels.

75-1883. Almog, C.; Seigelbaum, Y. (Med. Dep. C, Assaf Harofeh Gov. Hosp., Arifin, Israel). [**Paraquat poisoning in Israel.**] *Harefuah* 89(9): 400-403; 1974. (16 references) (Hebrew)

Paraquat (gramoxon; 1,1′-dimethyl-4,4′-dipyridilium) is widely used in Israel. A survey of all hospitalized cases is discussed. Ten cases (7 accidental poisonings and 4 suicide attempts) are summarized. The nervous system, gastrointestinal tract, kidneys, and liver are affected during the first week of exposure. During the recovery period, pulmonary involvement with severe respiratory complications may occur. Late deaths are usually attributed to this. Extreme forced diuresis and prolonged hemodialysis appear to be the logical treatment because pulmonary involvement occurs late in the disease after most of the poison has been excreted. Three of the patients died and seven showed complete recovery. Some of the patients were probably saved due to the above treatment.

75-1884. Guyon, F.; Bismuth, C.; Leclerc, J. P.; Dauchy, F. (Lab. Cent. Biochim., Clin Toxicol., Hop. Fernand-Widal, Paris, France). **Intoxication massive par le paraquat mortelle en moins de 24 hr. Donnees toxicologiques et anatomocliniques.** [**Massive poisoning by paraquat, fatal in less than 24 h. - toxicological and clinical anatomic data.**] *J. Eur. Toxicol.* 7(3): 182-187; 1975. (9 references) (French)

A case of paraquat poisoning (dosage exceeding 300 mg/kg) is studied. Ingestion led gradually to refractory circulatory deficiency—pressures in the heart cavities and cardiac output were low—and resulted in decerebration. Paraquat found in visceral tissues was two to seven times the amount found in plasma. Interstitial edema and alveolitis without fibrosis were among several types of lesions found in the lungs. Clinical evidence of myocarditis and adrenal and liver cell necrosis appeared before collapse. Death occurred within twenty-three hours.

75-1885. Borchard, F.; Grabensee, B.; Jax, W.; Huth, F. (Pathol. Inst., Univ. Duesseldorf, Duesseldorf, Germany). **Morphologische Befunde bei Paraquatvergiftungen.** [**Electron and light microscopic findings in human poisoning.**] *Klin. Wochenschr.* 52(14): 657-671; 1974. (58 references) (German)

Light and electron microscopic examinations performed in 2 cases of paraquat (1,1′-dimethyl-4,4′-bipyridilium-dichloride) intoxication demonstrated that specific histopathologic changes depend on the amount of poison absorbed and may be accentuated by oxygen therapy. Damage to the pneumocytes and basement membrane prevailed, followed by pulmonary edema and fibrosis. Visible changes of toxic liver damage became apparent prior to or simultaneously with these lung findings. Giant mitochondria with paracrystalline inclusion bodies within the liver cells are assumed to represent a specific reaction to the poison. Fragmentation of myofibrils and edema of myocardial cells can also be part of this reaction.

75-1886. Axelson, O.; Rehn, M.; Sundell, L. (Clin. Ind. Med., Regional Hosp., Orebro, Sweden). **Exposition for herbicider—mortalitet och tumorincidens. En epidemiologisk undersokning av svenska jarnvagsarbetare.** [**Herbicide exposure—mortality and tumor incidence. An epidemiological survey on Swedish railroad workers.**] *Laekartidningen* 71(24): 2466-2470; 1974. (12 references) (Swedish)

An epidemiological investigation was made of tumor incidence and mortality in Swedish railway workers exposed to various herbicides. A slightly dose-response related and significantly increased tumor incidence and mortality among railway workers exposed to amitrole (3-amino-1,2,4-triazole) was shown. Almost normal conditions were found in those exposed to phenoxy acids (2,4-dichlorophenoxyacetic acid, 2,4-D; and 2,4,5-trichlorophenoxyacetic acid, 2,4,5-T). Animal experiments suggest that amitrole may produce malignant tumors in several different organs, but tumors of the thyroid and liver have received the most attention. Exposure to amitrole in this study is partly related to simultaneous exposure to diuron (3-[3,4-dichlorophenyl]-1,1-dimethylurea) and monuron (3-[*p*-chlorophenyl]-1,1-dimethylurea), which makes the assessment of a definite correlation between tumor increase and exposure to amitrole more difficult. This point leaves the study open to criticism, but the close agreement with data from animal experiments supports the recommendation that amitrole be used with extreme caution.

75-1887. Fowler, B. A.; Weissberg, J. B. (P. O. Box 12233, Research Triangle Park, NC 27709). **Arsine poisoning.** *N. Engl. J. Med.* 291(22): 1171-1174; 1974. (75 references)

Arsine poisoning is reviewed with emphasis on its clinical features, pathogenesis, and treatment. The maximum safe concentration for prolonged arsine exposure is set at 0.05 ppm. There is concern for the safety of workers in forestry areas treated with various chemicals

because of the toxicity of arsine. The interval between exposure to arsine and the onset of symptoms is variable. The initial symptoms are usually of a vague, constitutional nature with headache, malaise, weakness, dizziness, and dyspnea accompanied by gastrointestinal disturbance. The rapid and fulminant hemolysis of red blood cells is a unique and characteristic feacture of arsine poisoning. Hemoglobin concentrations of less than 10 g/100 ml are not unusual. The treatment of choice for acute and severe arsine poisoning is exchange transfusion and, if renal failure develops, hemodialysis. The prognosis in arsine poisoning depends largely on the degree of damage inflicted on the kidneys.

75-1888. Szokolay, A.; Uhnak, J. (Forschungsinst. Hyg., Bratislava, Czechoslovakia). **Beitrag zur Bestimmung der Toleranzwerte der DDT - und BHC-Rueckstaende im Milchfett. [Contribution to the determination of the tolerance of DDT and BHC residues in milk fat.]** *Nahrung* 18(8): 807-811; 1974. (21 references) (German)

Studies on milk fat contamination by chlorinated insecticide residues in Czechoslovakia (1970-72) revealed human exposure to be 0.038 μg (BHC) and 0.053 μg (DDT) per kg of body weight per day. A new acceptable BHC intake value, 0.00625 mg/kg body weight, is suggested for the calculation of the permissible residue levels in milk fat. A tolerance in milk and milk products of 0.4 mg/kg for DDT and 0.5 mg/kg for BHC is proposed for Czechoslovakia.

75-1889. Neyko, E. M.; Drin', M. M.; Lanoviy, I. D.; Yurkevich, S. T.; Gerasimchuk, G. S. (Dep. Therapy, Ivano-Frankovsk Inst. Med., Ivano-Frankovsk, USSR). **Deyaki pokazniki periferichnoi krovi, aktivnosti fermentiv i generativnoi funktsii zhinok, zv'yazanikh z virobnitstvom pestisidu tsineb. [Certain parameters of peripheral blood, enzyme activity, and reproductive function in women working in zineb manufacturing plants.]** *Pediatr. Akush. Ginekol.* 36(6): 56-59; 1974. (Ukrainian)

Parameters of peripheral blood, enzyme activity, and the reproductive function were investigated in 150 female workers occupationally exposed to zineb in a chemical plant. Moderate anemia with relatively high color index, and a tendency toward a declining lymphocyte count were observed. Slightly increased cerulopasmin activity, increased degree of saturation of the plasma transferrin with iron, and reduction of the total SH group level were found in the peripheral blood. The blood transaminase activity was significantly higher than in the control group. The incidence of toxicosis during pregnancy and abortion was higher in exposed than in control females. The findings indicate that pregnant females should not be exposed to zineb.

75-1890. Mazorchuk, B. F.; Zhukova, O. S.; Mazorchuk, S. G.; Fedorchenko, V. S. (Dep. Obstet. Gynecol., Fac. Med., Kiev, USSR). **Vmist deyakihk khlororganichnikh pestitsidiv u krovi vagitnikh zhinok ta embrionakh pri mimovil'nikh vikidnyakh. [Certain organochlorine pesticide levels in the blood of pregnant females and their fetuses in spontaneous abortion.]** *Pediat. Akush. Ginekol.* 36(6): 59-61; 1974. (Ukrainian)

The residue levels of DDT, DDE, DDD (TDE), polychloropinene, and BHC in the maternal blood and fetal tissues were investigated in pregnant females on the occasion of spontaneous abortion, and compared to those found in normal pregnancy. All pregnant females with abortion were exposed to organochlorine pesticides occupationally at varying degrees. The organochlorine pesticide residue level in the maternal blood averaged 0.127 ± 0.028 mg/l, and a residue level of 0.171 ± 0.081 mg/l was determined in fetal tissues. Traces of organochlorine pesticides up to 0.008 mg/l were found in the blood of 6 of the 20 pregnant females in the control group, and no residues were found in embyronal tissues in this group. These findings indicate the influence of small doses of organochlorine pesticides on the pregnant organism and on the fetus.

75-1891. Finberg, L. (Dep. Pediat., Montefiore Hosp. Med. Cent., Bronx, New York NY 10467). **Interaction of the chemical environment with the infant and young child.** *Pediatrics* 53(5 part 2): 831-837; 1974. (16 references)

The interaction of the chemical environment with the infant and young child is discussed and the pathogenic effects of paraquat are explored. Chemical products and by-products have special implications for infants and children because maturation and growth processes are often qualitatively or quantitatively different from mature systems and because the infant and child have environments different from those of adults. Special foods for infants and children could be an environmental hazard because of the preservatives and other additives and the pollutants which enter the food chain naturally. Of these, organochlorine pesticides and polychlorinated biphenyls are not metabolizable and are stored in plant lipids, animal fats, and milk. There is circumstantial evidence linking paraquat with two cases, one of them fatal, of Hamman-Rich syndrome in children. The herbicide does produce a low-dose, chronic illness, primarily manifested by pulmonary fibrosis, in rats.

75-1892. Jonczyk, H.; Rudowski, W.; Traczyk, Z.; Klawe, Z. (Dep. Toxicol. Sanit., Warsaw, Poland). **Zawartosc DDT i jego metabolitow oraz gamma-HCH we krwi, szpiku i tkance tluszczowej w niektorych zespolach hematologicznych. [DDT and its metabolites and gamma-HCH in the blood, bone marrow and fatty tissue in certain hematological syndromes.]** *Pol. Tyg. Lek.* 29(37): 1573-1576; 1974. (12 references) (Polish)

The content of *p,p'*-DDT, *p,p'*-DDD (TDE), *p,p'*-DDE, and γ-BHC was determined in the blood of 55 subjects, in the fatty tissue of 76 subjects, and in bone marrow of 47 subjects with various hematological syndromes. A

statistically significant raised mean level of *p,p'*-DDE was present in the blood of patients compared with a control group of subjects showing no changes in the hematopoietic system. In 18 patients with raised *p,p'*-DDE blood level, 5 cases of pancytopenia were diagnosed while 3 patients had thrombocytopenia.

75-1893. Tamura, O.; Mitsui, S. (Sch. Ophthalmol., Fac. Med., Tokushima Univ., Tokushima, Japan). [**Relationship between consumption of pesticides and chronological changes in myopia in school children in Tokushima Prefecture.**] *Rinsho Ganka (Clin. Ophthalmol.)* 29(5): 51-55; 1975. (10 references) (Japanese)

The result of a statistical and epidemiologic investigation on the relationship between the chronological change in use of organophosphorus insecticides and the recent increase in incidence of myopia in school children in Tokushima Prefecture was described. The incidence of myopia was studied based on the data from 1957 to 1973, excluding 1970, on about 40,000 children from primary and middle schools. Even for children of the same age there was a great difference in the degree of increase in the morbidity was especially high in 1958, 1963, 1969, and 1972, and thereafter the morbidity was low in several consecutive years. In the year following any year when larger amounts of organophosphorus insecticides were consumed the morbidity from myopia in school children showed a rapid increase and vice versa. Based on these findings and Ishikawa's report that organophosphorus pesticide intoxication could possibly cause myopia, it is considered that the recent increase in myopia in school children was due, at least to a certain extent, to chronic intoxication of organophosphorus insecticides.

75-1894. Anonymous. [**Announcement of standard for suspending registration of agricultural pesticides.**] *Shokubutsu Boeki (Plant Protect.)* 29(6): 262; 1975. (Japanese)

Conforming to the Laws on Regulation of Agricultural Chemicals, standards for suspending registrations of pesticides were announced on May 10, 1975. The announcement has the same form as the pesticide residue standards announced following the Law of Food Sanitation. The standards are as follows: 0.05 ppm or rice, wheat, barley, cereals, fruits, vegetables, potatoes, and legumes for 3 - (3,4 - dichlorophenyl) - 1,1 - dimethylurea; 0.1 ppm on fruits, vegetables, and potatoes from *O,O* - dimethyl *S* - (*N* - formyl - *N* - methyl carbamoyl - methyl) - dithio - phosphate; 0.2 ppm on fruits and vegetables for *O,O* - dimethyl *S* - (5 - methoxy - 2 - oxo - 1,3,4 - thia - diazolin - 3 - ylmethyl) - dithio - phosphate; 0.5 ppm on rice, vegetables, potatoes, sugar beet, and tea for *S* - methyl *N* - (methyl - carbamoyl - oxy) - thioacetoamidate; 0.5 ppm on fruits and vegetables for 6 - methyl - quinoxaline - 2,3 - dithiocarbamate; 5.0 ppm on rice, fruits, and vegetables (except for tomato, cucumber, and legumes) for *N* - (trichloromethylthio) - 4 - cyclohexene-1,2 - dicarboximide. The announcement was issued by the Environment Agency from the viewpoint of preventing pollution of the environment.

75-1895. Worrell, C. L. (1717 No. E. St., Suite 308, Pensacola, FL 32501). **The management of organophosphate intoxication.** *South. Med. J.* 68(3): 335-339; 1975. (9 references)

The toxicity of organophosphorus compounds is due to their powerful inhibiting effect on carboxylic ester hydroxylases (including acetylcholinesterase which is present in human erythrocytes, nerves, synapses, and skeletal muscle) and on cholinesterase present in human plasma and in the liver. Miosis, one of the most characterisitic signs, is found in about 90% of the patients with moderately severe or severe poisoning. Organophosphorus compunds may be absorbed by virtually any route, i.e., skin, conjunctiva, or respiratory or gastrointestinal mucosa. The time interval between exposure and onset of symptoms may be as short as 5 min, but is usually less than 12 hr and always less than 24 hr. The severity of poisoning is dependent on the extent of synaptic inhibition of acetylcholinesterase and may be assessed by measuring cholinesterase activity in red blood cells, in the serum, or in whole blood. Frequently treatment must be started before such measurements are completed. Diagnosis is based on clinical signs and symptoms and a history of exposure in the past 24 hr. Treatment in the United States is based on two drugs, atropine which blocks muscarinic and central nervous system effects, and pralidoxime (PAM) which competes with aectylcholinesterase for the phosphorus radical of the organophosphorus compound. Treatment consists of three steps. First, maintain a clear airway and give artificial respiation if necessary. Second, administer atropine sulfate (4 to 8 mg, i.v., every 10 min for severe cases) until full atropinization occurs. If cyanosis can be corrected before using atropine, do so, as atropinization in the presence of cyanosis risks ventricular fibrillation. Third, administer PAM (1 g for adults or 0.25 g for infants) (10 to 12 mg/kg) i.v. at a slow rate. PAM may be repeated after 1 or 2 hr; atropine must be continued. A case report of a 2 yr old boy is detailed, which illustrates the tremendously high doses of atropine which may be required to block the acetylcholine accumulated at cholinergic synapses as a result of phosphorylation of acetylcholinesterase by organophosphorus compounds. A total of 707.2 mg atropine of which 681.2 mg was given parenterally was necessary during the hospital stay of 19 days.

75-1896. Haavik, T. K.; Ihlen, H. (Medisinisk Avdeling, Sentralsykehuset, Kristiansand, Norway). **Alkylfosfatforgiftning. Et forgiftningstilfelle med Lebaycid (Fenthion).** [**Alkyl phosphate poisoning. A case of Lebaycid (fenthion) poisoning.**] *Tidsskr. Nor. Laegeforen.* 94: 1251-1253; 1974. (8 references) (Norwegian)

One case of acute poisoning in a 44-year-old male due to the intentional ingestion of 50 ml Lebaycid (fenthion), corresponding to a dose of 310 mg/kg of body weight, is reported. The patient, hospitalized within 3 hours after poisoning, showed only a few mild symptoms of poisoning, such as general depression, somnolence, and contracted pupils, while his respiration was normal. Atropine,

toxogonin, and pralidoxime therapy was successful, but two episodes of aggravation which required tracheotomy occurred. The findings indicate that the cholinesterase inhibiting effect of alkyl phosphate pesticides can persist for several weeks, thus justifying intensive care.

75-1897. Nuritdinova, F. N. (Uzbek Sci. Res. Inst. Sanit., Hyg., Ind. Diseases, USSR). **O toksicheskom deystvii fosfororganicheskikh pestitsidov na organ zreniya.** [**Toxic effect of organophosphorus pesticides on the organ of vision.**] *Vestn. Oftalmol.* 1: 75-76; 1975. (Russian)

Toxic effects of organophosphorus pesticides on the eye were demonstrated in 683 subjects occupationally exposed to organophosphorus pesticides for 1 to 18 years. Pathology of the eye was detected in 90 ± 1.7% of all subjects as a function of the duration of the exposure. Dystrophic and atrophic changes of the iris, stenosis of the retinal arteries, hemorrhage, arteriosclerosis, narrowing of the field of vision, anesthesia of the iris, reduced color perception and sensitivity to light, and increased dark adaptation time were found. Impaired vision was determined in 53% of all patients.

75-1898. Anonymous. **Poisoning hazards for pets.** *Vet. Rec.* 96(17): 372-373; 1975.

The diagnosis of poisoning of pets is discussed and poisoning hazards in the home are described. Diagnosis of poisoning is based on four types of evidence: clinical, pathological, analytical, and circumstantial. Dogs, particularly when young, are indiscriminate and voracious feeders. Cats, although more fastidious, suffer from several defective detoxication mechanisms; and via their habit of washing, any toxic substance could be transferred from coat or paws to the alimentary tract. Birds generally are more resistant to solid and liquid poisons, but are more susceptible to gases and vapors. Many gardening chemicals are toxic. Slug pellets, rat poison, weedkiller, and insecticides are common hazards. There is no known treatment for poisoning by the weedkiller paraquat.

75-1899. Sasinovich, L. M.; Alekhina, S. M.; Odintsova, I. L. (Dep. Gen. Exp. Toxicol., Chem. Pathol., All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, and Plastics, Kiev, USSR). **Osobennosti techeniya toksicheskogo gepatita, voznikayushchego pri dlitel'nom vozdeystvii preparatov (GKhTsG) geksakhlortsiklogeksana.** [**Toxic hepatitis due to prolonged exposure to BHC.**] *Vrach. Delo* 10: 133-135; 1974. (3 references) (Russian)

Biochemical manifestations of toxic hepatitis caused by prolonged occupational exposure to BHC were studied in 59 females and 29 males with exposure times generally ranging from 11 to 23 yr, as well as in rats fed 1.7 mg/kg doses of lindane daily for 9 months. Pathological condition of the hepatobiliary system was diagnosed in 55% of the workers, including chronic hepatitis in 33%, and chronic pancreatitis in 5%. The biochemical parameters were abnormal in 60% of all cases. Increased alanine aminotransferase activity, reduced alkaline phosphatase activity, dysproteinemia (reduced albumin and increased globulin levels), as well as reduction of the lipase and amylase activities were observed. The animal tests revealed, in conformity with the clinical findingsn reduced hippuric acid biosynthesis in the adrenals, reduction of the hexenal-induced sleep, reduction of the albumin-globulin coefficient, and considerable decrease in the liver and serum alkaline phosphatase activities.

75-1900. Gerasimchuk, A. S.; Neyko, Ye. M.; Banenko, N. A.; Denisyuk, V. G. (Dep. Therapy, Ivano-Frankovsk Inst., Ivano-Frankovsk, USSR). **Funktional'noye sostoyaniye apparata vneshnego dykhaniya u rabochikh kompleksa "Tsineb".** [**Functional state of the external, respirtory apparatus in workers contact with zineb.**] *Vrach. Delo.* 1: 125-127; 1975. (5 references) (Russian)

The status of the respiratory apparatus was examined in 41 male workers exposed to zineb during the manufacturing process for 1 and 6 months, respectively. The respiration rate decreased from 20/min after 1 month to 19/ min after months. The minute volume increased by 3.9 liters after 1 month, and by 3.3 liters after 6 months. The reserve coefficient was 4.3 ± 0.5 liters after one month, and 3.9 ± 0.44 liters after 6 months, against the control vaue of 8 ± 2 liters. The oxygen consumption was 0.46 ± 0.1 in the exposed group, and 0.27 ± 0.02 in the control group. The findings indicate that exposure to zineb may induce changes reducing the bronchial passage.

75-1901. Jordanova, E.; Dochovskiy, D.; Mishkova, R.; Perfanov, K.; Kapralov, G. (Med. Fac. Varna, Varna, Bulgaria). **Khematologichni i enzimni izsledvaniya pri selskostopanski rabotnitsi s ostra intrationova intoksikatsiya.** [**Hematologic and enyzme examinations in agricultural workers with acute intrathion intoxication.**] *Vutr. Boles.* 13(3): 59-62; 1974. (9 references) (Bulgarian)

An observation of acute intrathion (thiometon) intoxication in 12 female agricultural workers is reported. Clinical observation revealed syndromes of total intoxication and nervous manifestations. There were no changes in the peripheral blood, and catalase activity showed a statistically significant decrease. Cell oxidase showed no change and cytochrome oxidase decreased in only two workers. Ceruloplasmin revealed elevated values in 1/3 of the subjects. Diminished catalase activity was apparent in 1/5 of those examined six months after contact with intrathion. Three of four workers maintained elevated ceruloplasmin content.

75-1902. Barthel, E (Klin. Lungenkrankh. Tuberkulose, Amsee, DDR). **Lungenfibrosen beim beruflichen Umgang mit Pflanzenschutzmittel.** [**Pulmonary fibroses in persons occupationally exposed to pesticides.**] *Z. Erkr. Atmungsorg.* 141: 7-17; 1974. (41 references) (German)

A report is presented on three cases of lung fibrosis in workers engaged in pest control with many years of exposure to several pesticides (Spritz-Cupral 45, Spritz-Cupral-paste, zineb thiocarbamate, DDT, BHC, toxaphene, methyl, parathion DNOC, and MCPA). X-rays revealed disseminated foci mainly localized in the periphery of the lung, similar to that of silicosis, and diffuse spotted and striped shadows of the lung with signs of diffuse emphysema. The relations between exposure to pesticides and induction of lung fibrosis are discussed. Close relationships are presumed to exist between fibrosis of the lung and the inhaled carrier substances of the pesticides (slate-meal, kaolin, and talcum) as well as the active ingredients (chlorinated hydrocarbons, arsenates, thiram and others).

See also 75-1928 75-1973 75-2013

75-1903. Simon-Sylvestre, G. (Station Centrale d'Agronomie, I.N.R.A., Versailles, France). **Complexite des effets des pesticides sur l'equilibre biologique des sols et repercussion sur les cultures. [Complexity of the effects of pesticides on the soil biological equilibrium, and repercussion on cultures.]** *Agrochimica* 18(4): 334-343; 1974. (2 references) (French)

The effects of vapam, DD, chloropicrin, atrazine, simazine, and 2,4-D on the biological equilibrium of the soil was studied in field tests under different conditions. Chloropicrin used for soil disinfection suppressed Azotobacter and aerobic cellulolytic bacteria, but is exerted highly favorable effects on ammonification and on the inorganic nitrogen content of the soil. Slight reduction of the Azotobacter count due to DD was observed. This pesticide had little effect on the nitrogen content of the soil, and especially on cellulolytic bacteria. Vapam suppressed Azotobacter and cellulolytic bacteria. Atrazine, having been applied for 8 consecutive years, caused a considerable reduction in the soil microflora, and neither atrazine nor simazine had any effect on Azotobacter. Prolonged application of atrazine has led to a qualitative alteration of the celluloytic bacteria without any reduction in the germ count. The findings indicate the need for laboratory tests for the effects and aftereffects of pesticides on the soil microflora.

75-1904. Narain, P.; Datta, N. P. (Div. Soil Sci. Agric. Chem., Indian Agric. Res. Inst., New Delhi, India). **Influence of nitrification inhibitors and some insecticides on nitrification of urea and under aerobic and water-logged conditions.** *Agrochimica* 18(12): 79-89: 1974. (16 references)

The effect of nitrification inhibitors and some insecticides on the nitrification of urea under aerobic and water-logged conditions was investigated in five typical Indian soils. N-Serve 2-chloro-6-(trichloromethyl) pyridine and AM (2-amino-4-chloro-6-methyl pyrimide) nitrification inhibitors and lindane, aldrin, dieldrin, and heptachlor insecticides were used. The soils were supplied with 200 ppm nitrogen through urea and 5 ppm of nitrification inhibitors or insecticides, and incubated for 6 wk at 28°C under aerobic and water-logged conditions. Under aerobic condition, N-Serve and AM inhibitors inhibited nitrification in alluvial, black cotton, and red soils. In laterite soil only N-Serve was effective, while in saline alkali soil none of these inhibitors showed any effect. Similar doses of insecticides did not show any effect on nitrification. The rate of nitrification was fairly rapid in black cotton, laterite, and alluvial soils, was poor in red soil, and saline alkali soil practically did not show any nitrification. Under water-logged conditions neither the nitrification inhibitors nor the insecticides showed any effect on nitrification. Nitrification was impeded due to water-logging.

75-1905. Borona, V. P. (Uladovo-Lyulinets Exp. Improving Stn., Uladovo-Lyulinets, USSR). **Selektivnyye smesi gerbitsidov i ikh deystviye na elementy pitaniya i mikrofloru pochvy. [Selective mixtures of herbicides and their action on nutrients and soil microflora.]** *Agrokhimiya (Moscow)* 4: 131-134; 1974. (12 references) (Russian)

The efficiency of selective herbicide mixtures (tillam + lenacil and DCM + lenacil) in weed control and their action on the nutrient balance and microflora of the soil in sugarbeet fields was studied. The pesticide mixtures were more efficient than their individual components alone, and the mixtures caused no marked effect on the soil microflora, nor on the nitrate nitrogen and mobile phosphorus contents. Sharp reduction of the *Clostridium pasteurianum*, ammonifying bacteria, ologonitrophil, and phosphorus bacteria counts was observed during the first 18 days following application. The cellulolytic bacteria count was affected by TAC lenacil mixtures only. The microbiological bacteria count was unaffected in all experiments. Normalization of the microbiological processes in the soil was observed 56-60 days after herbicide application.

75-1906. Herbst, M.; Guenard, J.; Kollmer, H.; Stotzer, H. (Abt. Exp. Pathol. Toxikol., C. H. Boehringer Sohn, Ingelheim, Germany). **Zur Enzyminduktion in der Leber nach oraler Lindanapplikation. [Enzyme induction in the liver following administration of lindane by the oral route.]** *Arch. Toxikol.* 32(2): 115-130; 1974. (45 references) (German)

Functional, biochemical, and electron microscopic investigations were performed on male rats following short-term oral administration of lindane (56 mg/kg, 20 mg/kg). No effects of the lindane medication were found in movement and exploration, liver weight, and the histochemically detected enzymes. A dose-dependent and time-dependent reduction in the duration of sleep was measured after i.p. pentobarbital. There were no differences in the liver glycogen levels of treated and control animals when food was available to the animals ad libitum. After food was withdrawn for 24 hr, a tendency to reduced liver glycogen was observed in the treated animals. There was a distinct increase in the smooth endoplasmic reticulum, particularly in hepatocytes of the intermediary zone. The increase in free ribosomes was connected with the intensified formation fo microsomal protein. The reduced glycogen of individual cells was caused by a change in metabolism because of enzyme induction.

75-1907. Richou-Bac, L. (Lab. Cent. Rech. Vet., Maisons-Alfort, France). **Donnees nouvelles sur la toxicite des pesticides et des polluants organo-chlores. [New facts on the toxicity of pesticides and organochlorine contaminants.]** *Bull. Acad. Vet. France* 45(4): 175-187; 1972. (13 references) (French)

Recent studies on the toxicity of pesticides and PCBs are reviewed. The findings indicate more or less ubiquitous environmental contamination by low concentrations of organochlorine or organochlorine and diphenyl

pesticides. Residues of dieldrin, DDT and its metabolites, heptachlor epoxide,and BHC are responsible for most of the contamination by organochlorine pesticides. Recent experiments and studies are concerned primarily with the effects of pesticide residues at the microsomal and mitochondrial levels, on hepatic and endocrine functions, as well as with teratogenic, embryotoxic, and carcinogenic effects. Organochlorine pesticides were found to increase the weight of the liver, and to accelerate the microsomal protein and enzyme synthesis. While there is no irrefutable evidence of the carcinogenicity of organochlorine pesticides in mammals, *p,p'*-DDT was recently found to increase the incidence of hepatomas in mice when administered in doses of 46.4 mg/kg. The pesticide residue levels are generally too low to induce pathological or even physiological changes in the human orgaism.

75-1908. Maki, A. W.; Johnson, H. E. (Dep. Fisheries Wildlife, Michigan State Univ., East Lansing, MI 48824). **Effects of PCB (Aroclor 1254) and *p,p'*-DDT on production and survival of *Daphnia magna* Strauss.** *Bull. Environ. Contam. Toxicol.* 13(4): 412-416; 1975. (15 references)

The combined and individual effects of *p,p'*-DDT and PCB (Aroclor 1254) on the survival of *Daphnia magna* Strauss were studied in laboratory toxicity tests. The 2-week LC50 values for DDT and PCB were 0.67 ppb and 24.0 ppb, respectively. There was a 50% reduction in total young produced with 0.5 ppb DDT and 19.0 ppb PCB; acute toxicity and average brood size/day were less severely affected. When the two toxicants were tested together, the effects of each were significantly enhanced by the presence of the other, although the effect of the combined chemicals was somewhat less than would be expected if their effects were exactly additive. The findings indicate that *Daphnia magna* is a good indicator of the toxicity of both DDT and Aroclor 1254 as measured by static toxicity tests.

75-1909. St. John, L. E., Jr.; Lisk, D. J. (Pesticide Residue Lab., Dep. Food Sci., New York State Coll. Agric., Cornell Univ., Ithaca, NY 14850). **A feeding study with the herbicide, Kerb (*N*-(1,1-dimethylpropynyl)-3,5-dichlorobenzamide in the dairy cow.** *Bull. Environ. Contam. Toxicol.* 13(4): 433-435; 1975. (4 references)

A Holstein cow was catheterized and fed pure Kerb at a level of 5 ppm in the ration for 4 days. Morning and evening milk samples and daily urine and manure samples were analyzed for Kerb residues using electron affinity gas chromatography. Residues equivalent to 0.19% of the total dose of Kerb were found in the milk. The concentration reached a maximum of 0.04 ppm in the milk on the day following cessation of herbicide treatment. Residues of equivalent Kerb in the urine and feces totalled 44.38% and 4.47% of the total dose, respectively. Residues appeared rapidly in the milk and excreta when herbicide feeding began and reached nondetectable levels soon after treatment was ceased. Excretion of nondetectable metabolites probably accounted for the portion of the total herbicide not accounted for by gas chromatographic analysis of the milk and excreta.

75-1910. Neudorf, S.; Khan, M. A. Q. (Dep. Biol. Sci., Univ. Illinois at Chicago Circle, Chicago, IL 60680). **Pick-up and metabolism of DDT, dieldrin and photodieldrin by a fresh water alga (*Ankistrodesmus amalloides*) and a microcrustacean (*Daphnia pulex*).** *Bull. Environ. Contam. Toxicol.* 13(4): 443-450; 1975. (27 references)

The unicellular freshwater alga, *Ankistrodesmus amalloides*, and the microcrustacean, *Daphnia pulex*, were grown in the presence of 0.72 ppb ^{14}C-DDT, ^{14}C-dieldrin, or ^{14}C-photodieldrin, and the absorption/adsorption and metabolism of the pesticides measured using scintillation spectrometry and thin-layer chromatography. Over a 1-3 hr period, the total pick-up of DDT by *A. amalloides* was 2.5 times that of dieldrin and 10 times that of photodieldrin; these differences seem to be related to the water solubilities of the insecticides. The efficiency with which each cell picked up the insecticides decreased with increasing cell density. The time required for maximum absorption was 120 min for DDT, 30-60 min for dieldrin, and 30 min for photodieldrin. Dieldrin was biologically magnified 2-3 times less and photodieldrin about 6 times less than DDT in *A. amalloides*. The alga metabolized DDT to DDE (3.5%) and DDD (TDE) (0.8%). *Daphnia pulex* showed about 13.6% conversion of DDT to DDE, with no other DDT metabolites being detected in this species.

75-1911. Farris, F. F.; Smith, J. C. (Dep. Pharmacol. Toxicol., Univ. Rochester, Sch. Med. Dent., Rochester, NY 14620). **In vivo incorporation of ^{14}C-leucine into brain protein of methylmercury treated rats.** *Bull. Environ. Contam. Toxicol.* 13(4): 451-455; 1975. (7 references)

Pregnant Sprague-Dawley rats were injected s.c. with 1.0 mg methylmercury chloride at various times throughout their pregnancy. Two days after birth, the brains of some offspring were analyzed for methylmercury content, and some offspring were injected i.p. with 2 μCi ^{14}C-leucine. Incorporation of the latter substance into brain protein was determined 30 min later. In a second experiment, female rats were injected s.c. with 5 mg methylmercury chloride and 10 mg cystein or cystein alone for 3 days; 4 days later, all rats were injected i.v. with 13.9 μCi ^{14}C-leucine and its incorporation into brain protein determined 90 min later. In the first experiment, there was no significant difference in brain protein synthesis between the offspring of control (saline-treated) rats and methylmercury treated rats. The brain methylmercury concentrations of the offspring of the methylmercury-treated females varied from 4.5-9.7 μg/mg. In the second experiment, the methylmercury-treated adults showed signs of severe intoxication. The mean body weight of the poisoned animals at the end of the experiment was 63% that of the controls, and protein synthesis in the poisoned

animals was about 75% of that in the controls; leucine incorporation was significantly inhibited in the cerebellum, hemispheres, mid-brain, and occipital region of the poisoned animals. Brain mercury levels were approximately 54 ppm in the poisoned rats.

75-1912. Nelson, J. O.; Matsumura, F. (Dep. Entomol., Univ. Wisconsin, Madison, WI). **A simplified approach to studies of toxic toxaphene components.** *Bull. Environ. Contam. Toxicol.* 13(4): 464-470; 1975. (9 references)

Chlorine gas was bubbled into a reaction flask containing purified exo-2,10-dichlorobornane, and the reaction products examined using gas chromatography. Four products with increasing degrees of chlorination were obtained. The products were only slightly toxic to the alga, *Anacystis nidulans*, and slightly more toxic to larvae of the mosquito, *Aedes aegypti*. The LC50 values for the brine shrimp, *Artemia salina*, decreased with increasing degree of chlorination; products 3 and 4 were as toxic to the shrimp as toxaphene, but none of the products were as toxic as toxaphene to the other organisms studied. Optimum toxicity was associated with the chlorination pattern (8 chlorines) approximated by product 3, which has approximately the same gas-chromatographic pattern as toxaphene. Product 3 was separated on a Florisil column. Florisil fractions 13, 14, and 15, designated Peak 2, yielded toxicity values comparable to those of the toxic component from toxaphene for mosquito larvae, brine shrimp, and algae. The infrared and mass spectra of Peak 2 were identical with those of the toxic compound isolated from toxaphene. The use of a "simplified toxaphene" for the isolation of the toxic components of toxaphene appears to be a valid and useful approach.

75-1913. Dougherty, W. J.; Herbst, M.; Coulston, F. (Int. Cent. Environ. Safety, Albany Med. Coll., Holloman AFB, NM 88330). **The non-teratogenicity of 2,4,5-trichlorophenoxyacetic acid in the rhesus monkey (*Macaca mulatta*).** *Bull. Environ. Contam. Toxicol.* 13(4): 477-482; 1975. (13 references)

The herbicide 2,4,5-T, containing 0.05 ppm tetrachlorodibenzo-*p*-dioxin, was administered orally to pregnant rhesus monkeys daily from day 22 through day 38 of gestation; the dose level was 0.05, 1.0, or 10.0 mg/kg. The duration of gestation and weight at birth of the offspring were recorded and the offspring were necropsied shortly after birth, at 6 months, or at 1 year. None of the pregnant females showed signs of toxicity during the study. The mean gestation time and mean birth weight of each infant was within normal limits in all cases. There was one abortion and one stillbirth in the 1.0 mg/kg dose group and 2 abortions in the 10.0 mg/kg dose group; there was one absortion and one premature birth in the control group. Scheduled necropsies of the aborted, stillborn, and live offspring revealed no evidence of teratogenicity. Growth patterns, clinical chemistry, and hematology were similar among offspring of herbicide-treated and control mothers. Thus, at the dose levels given, 2,4,5-T containing 0.05 ppm TCDBD produces no evidence of teratogenicity or toxicity in the fetus of the nonhuman primate.

75-1914. Villeneuve, D. C.; Hierlihy, S. L. (Food Res. Div., Health Protect. Branch, Ottawa, Ontario, Canada). **Placental transfer of hexachlorobenzene in the rat.** *Bull. Environ. Contam. Toxicol.* 13(4): 489-491; 1975. (11 references)

Pregnant nulliparous Wistar rats were fed hexachlorobenzene (HCB, 5, 10, 20, 40, 80, or 120 mg/kg/day) in corn oil from day 6 through day 16 of pregnancy. The animals were killed on day 22 of gestation and the pups and maternal livers analyzed for HCB residues using electron-capture gas chromatography. HCB was found to cross the placenta and accumulate in the fetuses in a dose-dependent manner. At all dose levels, the highest HCB levels were found in the maternal liver, followed by the fetal liver, whole fetus, and fetal brain. No fetopathic effects were found at any dose level. The results suggest that the presence of HCB in the fetal and maternal tissues caused no apparent adverse effect on fetal development.

75-1915. Scherer, E. (Dep. Environ., Fisheries Marine Serv., Freshwater Inst., Winnipeg, Manitoba, Canada). **Avoidance of fenitrothion by goldfish (*Carassius auratus*).** *Bull. Environ. Contam. Toxicol.* 13(4): 492-496; 1975. (6 references)

Goldfish which had become acclimated to tap water were placed in counter-current chambers in which one half was filled with pure water and the other half was filled with water containing fenitrothion (0.01-100 mg/l). The fish avoided the water containing the pesticide, the degree of avoidance increasing with increasing pesticide concentration. A threshold of avoidance was found at a concentration of 0.01 mg/l, which is equivalent to 35.0 n*M*. The distribution of means and medians of individual avoidance reactions over the range of pesticide concentrations suggested a sigmoid curve with a rectilinear central portion; regression analysis supported this conclusion. The fenitrothion was solubilized in the water by adding Atlox, which did not contribute to the increase in avoidance with higher pesticide concentrations, but did appear to have slightly augmented the avoidance response over the whole range of concentrations. None of the fish died during the experiment, although there was a slight decrease in locomotor activity.

75-1916. Marking, L. L.; Mauck, W. L. (Fish Control Lab., La Crosse, WI 54601). **Toxicity of paired mixtures of candidate forest insecticides to rainbow trout.** *Bull. Environ. Contam. Toxicol.* 13(5): 518-523; 1975. (19 references)

The 96-hr toxicities of Zectran (mexacarb), Dylox (trichlorfon), volaton, Guthion (azinphosmethyl), SBP-1382, pyrethrum extract, and RU-11679, individually and in combination, were studied in rainbow trout. The carba-

mate (Zectran) was the least toxic and the synthetic pyrethroids (SBP-1382 and RU-11679) were the most toxic when testd individually. Less than additive toxicity (antagonism) was produced by mixtures of Zectran and volaton, Dylox and RU-11679, Dylox and pyrethrum, volaton and SBP-1382, Dylox and SBP-1382, Zectran and pyrethrum, Zectran and Dylox, Zectran and Guthion, and Guthion and pyrethrum. Additive toxicity was produced by mixtures of Guthion and SBP-1382, Zectran and SBP-1382, Guthion and RU-11679, volaton and pyrethrum, Zectran and RU-11679, Dylox and volaton, RU-11679 and pyrethrum, SBP-1382 and pyrethrum, and SBP-1382 and RU-11679. Greater than additive toxicity (synergism) was produced only by mixtures of Dylox and Guthion and volaton and RU-11679. None of the toxicities deviated markedly from additive.

75-1917. Yu, C. C.; Sanborn, J. R. (Illinois Natural History Survey, Illinois Agric. Exp. Stn., Urbana, IL 61801). **The fate of parathion in a model ecosystem.** *Bull. Environ. Contam. Toxicol.* 13(5): 543-550; 1975. (6 references)

The distribution and degradation of ^{14}C-parathion within a terrestrial-aquatic model ecosystem were determined. Except for the fish, which accumulated an average of 0.1006 ppm parathion, none of the organisms in the ecosystem (algae, *Daphnia*, mosquito, snails) accumulated parathion or paraoxon during the 38-day experiment. While most of the organisms contained radioactivity (0.40-3.8 ppm), 65% of this radioactivity in the algae, *Daphnia*, mosquito larvae, and snails was unextractable, while only 19.7% in the fish was unextractable. Every organism except the mosquito larvae contained dieldrin, approximately 97% of the extractable radioactivity representing this compound. Parathion constituted only 31.5% of the extractable radioactivity in the fish. The amount of parathion isolated from the fish was about 335-fold greater than the amount extracted from the water. *p*-Nitrophenol (8.6 ppb) was found in 1 fish in 1 of the ecosystems. *p*-Nitrophenol (1.4 ppb) was also found in the water, along with parathion (0.30 ppb) and paraoxon (0.47 ppb). The degradation of parathion in the water was slow, with a half-life of about 15-16 days. The unextractable material gradually increased, eventually reaching 45% of the radioactivity in the water. Thus parathion degraded into water soluble materials. The data indicates that the continued use of parathion for insect control will not result in the ubiquitous environmental contamination which has occurred with the use of chlorinated hydrocarbons such as DDT.

75-1918. Heinz, G. (U.S. Bureau Sport Fisheries Wildlife, Patuxent Wildlife Res. Cent., Laurel, MD 20811). **Effects of methylmercury on approach and avoidance behavior of mallard ducks.** *Bull. Environ. Contam. Toxicol.* 13(5): 554-564; 1975. (17 references)

Mallard ducks were fed a control diet or a diet containing 0.5 or 3 ppm mercury (as methylmercury dicyandiamide) based on the dry feed. These mercury diets are approximately equivalent to 0.1 and 0.6 ppm mercury in a natural succulent diet. Approach behavior in response to a tape-recorded maternal call and avoidance behavior in response to a frightening stimulus were measured in the ducklings produced by these birds. Although the ducklings from the control parents moved back and forth toward the maternal call more frequently and spent more time at the end of the runway near the loudspeaker compared with the ducklings from the mercury-fed (0.5 ppm) parents, the 2 groups did not differ significantly in the percentage of ducklings approaching the call. Compared with the controls, the ducklings from the mercury-fed parents were hyper-responsive in the avoidance test. On a dry-weight basis, the concentration of mercury in the eggs from which the ducklings were hatched was about 6 times as great as that in the feed for the parents fed the 0.5 ppm diet and about 6-9 times as great for the parents fed the 3 ppm diet.

75-1919. Sheridan, R. P.; Simms, M. A. (Botany Dep., Univ. Montana, Missoula, MT 59801). **Effect of the insecticide Zectran (mexacarbate) on several algae.** *Bull. Environ. Contam. Toxicol.* 13(5): 565-569; 1975. (10 references)

Field samples of freshwater algae were examined to determine the effect of the insecticide Zectran (mexicarb) on the rate of photosynthesis. Concentrations of Zectran between 10 and 10^3 ppb affected neither O_2 production nor the uptake of $NaH^{14}CO_3$ in any of the 7 genera tested. However, Zectran at a concentration of 10^4 ppb effected a reduction in the rate of photosynthesis by *Chroococcus*, *Oedogonium* and a mixed sample of *Zygnema*, *Mougeotia*, and *Spirogyra* after 1 hr. *Mougeotia*, *Spirogyra*, and *Schizogonium* were not affected by 1 hr of exposure to 10^4 ppb Zectran, but O_2 production was significantly reduced after 24 hr of exposure to the same concentration. The direct spraying of a lake 4046 m^2 by 1 m deep with Zectran at the registered concentration of 68 g/acre would result in a Zectran concentration of 16.6 ppb, which is approximately 100-fold less than that required to cause a decrease in growth in the algal species tested.

75-1920. Khan, H. M.; Neudorf, S.; Khan, M. A. Q. (Dep. Biol. Sci., Univ. Illinois at Chicago Circle, Chicago, IL). **Absorption and elimination of photodieldrin by *Daphnia* and goldfish.** *Bull. Environ. Contam. Toxicol.* 13(5): 582-587; 1975. (14 references)

Algae (*Ankistrodesmus spiralis*), freshwater fleas (*Daphnia pulex*), and goldfish were exposed to photodieldrin for varying periods of time at concentrations of 3.33 ppb (algae and *Daphnia*) and 20 ppb (goldfish). The algae became saturated with photodieldrin within 8 hr. The *Daphnia*, whether contaminated by feeding on algae saturated with photodieldrin or by direct absorption of the insecticide, eliminated about 50% of the absorbed photodieldrin within 4 days; 70% of the accumulated insecticide was eliminated in 7 days. However, continuous exposure of daphnids to photodieldrin resulted in an increased ab-

sorption and accumulation of the insecticide. Transfer of the goldfish contaminated with photodieldrin to clean water resulted in the rapid elimination of insecticide during the first 24 hr; the rate was reduced after that time. Thus, both *Daphnia* and goldfish are able to eliminate their body residues of photodieldrin in their environment if decontaminated.

75-1921. Iverson, F.; Grant, D. L.; Lacroix, J. (Pesticide Sect., Chem. Safety Bureau, Health Protection Br., Tunney's Pasture, Ottawa, Ontario, Canada). **Diazinon metabolism in the dog.** *Bull. Environ. Contam. Toxicol.* 13(5): 611-618; 1975. (11 references)

Female beagle dogs were given ^{14}C-ethoxy diazinon i.v. (0.2 mg/kg) or orally (4.0 mg/kg), and the metabolite concentrations in the venous blood and urine determined at various intervals thereafter. Another dog was dosed orally (2 mg/kg) with the metabolite resulting from the acid hydrolysis of ring-labeled diazinon. The half life of diazinon in the blood following i.v. administration was 363 min. Diazinon i.v. rapidly depressed the serum cholinesterase levels, maximal depression (50%) being obtained after 150 min. After 24 hr, 58% of the i.v. administered dose was recovered in the urine; the urinary radioactivity was entirely accounted for by the 2 metabolites, diethyl phosphoric acid (DEP) and diethyl phosphorothioic acid (DETP). Following oral administration, 85% of the administered dose was recovered in the urine; a water soluble fraction accounted for 53% of the total radioactivity, with 2 pyrimidinol metabolites accounting for the remainder. The pattern of metabolites recovered in the urine following oral administration of the hydrolysis product was essentially similar to that following oral administration of the parent compound. The results indicate that diazinon metabolism in the dog proceeds rapidly and is relatively complete.

75-1922. Litterst, C. L.; Miller, E. (Lab. Toxicol., Natl. Cancer Inst., Natl. Inst. Health, Bethesda, MD 20014). **Distribution of lindane in brains of control and phenobarbital pretreated dogs at the onset of lindane-induced convulsions.** *Bull. Environ. Contam. Toxicol.* 13(5): 619-624; 1975. (15 references)

Male beagle dogs were maintained for 60 days on normal chow or chow supplemented with 35 mg/kg/day of phenobarbital-sodium. After 60 days, all animals were infused i.v. with a lindane emulsion at a rate of 7.5 mg lindane per min; the infusion was continued for 60-70 min or until the animals convulsed. The control dogs convulsed after a mean period of 27 min, while the phenobarbital-pretreated animals failed to convulse within 60-70 min. The blood lindane concentrations in the 2 groups were equal throughout the first 24 min of infusion, but those of the phenobarbital-pretreated group were significantly higher by the end of the infusion period. The concentrations of lindane in the medulla and occipital cortex at the end of the infusion period were higher in the phenobarbital-pretreated dogs than in the controls; the reverse was true of the pons. A significantly smaller amount of the total lindane administered was found in the brains of the phenobarbital-pretreated dogs compared with the controls. The brain lindane concentrations did not differ between the 2 groups. The results suggest that phenobarbital treatment may have altered the sensitivity of the brain to the convulsive effect of lindane and that phenobarbital pretreatment decreases the uptake of lindane into some brain structures.

75-1923. Maguire, J.; Watkin, N. (Water Sci. Sect., Dep. Environ., Ottawa, Ontario, Canada). **Carbonic anhydrase inhibition.** *Bull. Environ. Contam. Toxicol.* 13(5): 625-629; 1975. (15 references)

The effects of dioxane, mercuric chloride, *p*-chloromercuribenzoic acid, cadmium chloride, lead nitrate, silver nitrate, methylmercuric chloride, phenylmercuric chloride, dieldrin, DDT, 2,4,5-T, chlordane, and parathion on the hydrolysis of *p*-nitrophenyl acetate (NPA) by bovine carbonic anhydrase (CA) in 5% dioxane solution were studied. Mercuric chloride, *p*-chloromercuribenzoic acid, and cadmium chloride were powerful inactivators of CA; complete abolition of activity occurred at an inhibitor:enzyme ratio of 1:1. Methylmercuric chloride, phenylmercuric chloride, lead nitrate, and silver nitrate appeared to inhibit the reaction noncompetitively; the former 2 compounds were 30-100-fold more potent inhibitors of CA esterase than were the latter 2. Dieldrin, DDT, and chlordane, but not parathion, were fairly weak noncompetitive inhibitors of the reaction; 2,4,5-T was a stronger inhibitor. The lack of inhibition by parathion indicates that CA activity is not dependent on a serine residue at the active site.

75-1924. David, D.; Lutz-Ostertag, Y. (Lab. Biol. Anim., Universite de Clermont, Aubiere, France). **Action des gonades d'embryons de Poulet et de Caille issus d'oeufs traites au DDT sur des embryons-hotes de Poulet, en greffe chorio-allantoidienne.** [**Action of gonads from chicken and quail embryos obtained from eggs treated with DDT on host embryos of chickens in chorio-allantoic grafts.**] *C. R. Hebd. Seances Acad. Sci. Ser. D* 280(8): 1011-1014; 1975. (13 references) (French)

Fragmented gonads of 16-18 day old chicken embryos and 12-13 day old quail embryos from eggs immersed in 0.5% DDT solution for 30 sec prior to incubation was grafted in the allantois of 5-day-old chicken embryos in untreated eggs. The gonadal grafts of DDT-treated chicken and quail embryos had an estrogenic, ambosexual action on male chicken host embryos, and superfeminizing action on female host embryos. In addition, the explants provoked anomalies in the morphological differentiation, such as reduced body size, lordosis, paralysis of the feet, and hepatic changes. Inflated liver was found in 50% of the hosts. The alterations were of the same order of magnitude as those found in embryos from eggs immersed in 0.3% DDT suspension.

75-1925. Meiniel, R. (Lab. Biol. Anim., Unviersite de Clermont, Aubiere, France). **Prevention par la pralidoxime de certains effets teratogenes induits par le bidrin chez l'embryon de Caille. [Prevention of certain teratogenic effects of bidrin in quail embryos by pralidoxime.]** *C. R. Hebd. Seances Acad. Sci. Ser. D* 280(8): 1019-1022; 1975. (14 references) (French)

The teratogenic action of bidrin in quail embryos, and the prevention of teratogenesis by pralidoxime were studied. Microphthalmia, axial and limb anomalies, scoliosis, and malformation of the bill were found in quail embryos treated with 0.25 mg bidrin in intravitelline application before incubation, and sacrificed on the 10th day of incubation. Pralidoxime, introduced into the vitellum in a dose of 1 mg in 50 μl physiological solution on the 3rd and 5th days of the incubation, protected the embryos from axial malformations, while it had little or no effect on the morphogenesis of the malformed bill and limbs.

75-1926. Decloitre, F.; Chauveau, J.; Benoit, A.; Martin, M. (Inst. Rech. Sci. Cancer, Villejuif, France). **Metabolisation et fixation in vitro par le DNA de thymus de veau et les proteines microsomiques de foie de rat de quelques pesticides organochlores et organophosphores. [In vitro metabolism and retention of certain organochlorine and organophosphorus pesticides by calf thymus DNA and rat liver microsomal proteins.]** *C. R. Hebd. Seances Acad. Sci. Ser. D* 280(8): 1027-1030; 1975. (12 references) (French)

The metabolism of ethylparathion, lindane, aldrin, and dieldrin by rat liver microsomal enzymes, and the binding of the metabolites by calf thymus DNA and rat liver microsomal proteins was studied in vitro, using ^{14}C-labeled pesticides. Metabolism of ethylparathion and fixation of large quantities of metabolites by calf thymus DNA was observed in the presence of rat liver microsomal enzyme preparation. The rate of enzymatic fixation doubled when microsomal enyzme preparations obtained from rats previously induced with phenobarbital (3 i.p. injections daily in a dose of 80 mg/kg) or 3-methylcholanthrene (1 i.p. injection of 20 mg/kg) were used. The organochlorine pesticides yielded no metabolites susceptible to being bound on DNA or proteins.

75-1927. Boyd, E. M. (Dep. Pharmacol., Queen's Univ., Kingston, Ontario, Canada). **Protein deficiency and pesticide toxicity.** Charles C. Thomas, Publ., Springfield, IL, 1972, 468 p. (718 references)

The studies reported in this volume were intended to provide information which could be used to predict the toxicity of pesticides among the inhabitants of under-developed nations where the diet is generally low in protein. Standard low-protein animal diets were developed and the test animals were maintained on these diets for 28 days after weaning before the beginning the pesticide administration in acute toxicity studies. Protein deficiency increased the susceptibility of albino rats to pesticide intoxication to varying degrees: the toxicity of dimethoate was not altered in a group fed one third the normal protein level in comparison to controls, whereas the toxicity of captan was increased two thousand fold. The clinical pathological signs of intoxication were unaltered. A similar difference in susceptibility to pesticides was encountered in chronic studies. Pesticides examined included organochlorines (chlordane, DDT, endosulfan, endrin, lindane, and toxaphene); organophosphates (demeton, diazinon, dimethoate, malathion, and parathion); carbaryl; herbicides (chlorpropham, diuron, and monuron); and captan.

75-1928. Anonymous. **Toxaphene in streams may cause fish spine defect.** *Chem. Eng. News* 53(16): 30; 1975.

Evidence that exposure of fish to toxaphene in aquatic environments may cause spine defects is presented. X-ray photographs of experimental fish, such as fathead minnows, show a gross deformity of the spine. In trials with fish raised in aquariums containing 55 ng/l of toxaphene for about 150 days, more than 75% of the fish examined by x-ray showed the broken back abnormality. Toxaphene acts by attacking the skeleton of the fish and decreasing its collagen or protein content, which results in a brittle spine that snaps easily. Once crippled, fish cannot swim properly or maintain their normal body position, increasing chances of death. The broken back syndrome was observed by government scientists in 3-5% of channel catfish in an Arkansas pond.

75-1929. Virmani, M.; Evans, J. O.; Lynn, R. I. (Utah State Univ., Logan, UT). **Preliminary studies of the effects of *s*-triazine, carbamate, urea, and karbutilate herbicides on growth of fresh water algae.** *Chemosphere* 4(2): 65-71; 1975. (13 references)

The effects of diuron, karbutilate, propham, chlorpropham, atrazine, and simazine on the fresh water algae *Chlorococcum hypnosporum* and *Chlorella pyrenoidosa* were investigated. Growth of both algae was inhibited to varying degrees by different herbicides. Growth of *Chlorococcum* was inhibited by 65% at a diuron concentration of 0.4 ppm, while 90% inhibition of growth was observed at 0.1 ppm diuron for *C. pyrenoidosa*. Karbutilate from 10-25 ppm inhibited growth in *Chlorococcum* by 90% while 2.5 ppm suppressed growth to 55% of the controls. With *C. pyrenoidosa* 2.0 ppm karbutilate gave a 90% inhibition and 5.0 ppm was algicidal. Propham at 25 ppm reduced growth of *Chlorococcum* by 74%, while 50 ppm yielded growth equal to 30% of that of *Chlorella* control cultures. Atrazine at 1.0 ppm reduced growth of *C. pyrenoidosa* by 95% while at 0.5 ppm at 70% inhibition was observed. Concentrations of 5.0 ppm or greater were required to induce any growth reduction of *Chlorococcum*. Simazine at 1.0 ppm or greater effectively inhibited the growth of both organisms.

75-1930. Mueller, W.; Nohynek, G.; Woods, G.; Korte, F.; Coulston, F. (Inst. Oekol. Chem., Gesellschaft fuer

Strahlen- und Umweltforschung, Munich, Germany). **Comparative metabolism of dieldrin-^{14}C in mouse, rat, rabbit, Rhesus monkey, and chimpanzee.** *Chemosphere* 4(2): 89-92; 1975. (5 references)

A comparison metabolism study of dieldrin was conducted with Swiss white mice, Sprague-Dawley rats, New Zealand white rabbits, Rhesus monkeys, and a chimpanzee (*Pan troglodutes*). Dieldrin was administered to the animals as a single oral dose of 0.5 mg/kg body weight. In all five species 12-hydroxy-dieldrin and 4,5-aldrin-*trans*-dihydrodiol were the major metabolites. The rat was comparable to the primates; direct oxidation resulting in the monohydroxy metabolite is their common main metabolic pathway. In the mouse and the rabbit, the opening of the epoxide to the diol is the predominant reaction. The metabolism rate (33-34%) was highest in the mouse.

75-1931. Mueller, W.; Woods, G.; Korte, F.; Coulston, F. (Inst. Oekol. Chem. Gesellschaft fuer Strahlen- und Umweltforschung, Munich, Germany). **Metabolism and organ distribution of dieldrin ^{14}C in rhesus monkeys after single oral and intravenous administration.** *Chemosphere* 4(2): 93-98; 1975. (3 references)

The metabolism and organ distribution of dieldrin-^{14}C was investigated in adult rhesus monkeys after single oral and intravenous administration. The intravenous dose was 2.5 mg/kg body weight of dieldrin-^{14}C administered to two females. For the oral administration, the doses were 0.5 mg/kg body weight for one monkey and 0.36 mg/kg for the other. After both types of administration, the adipose tissue and the bone marrow contained most of the radioactive material. There was a short period of relatively rapid excretion and a subsequent change to very low elimination rates. The main pathway of metabolic conversion was the direct oxidation resulting in 12-hydroxy-dieldrin. The opening of the epoxide leading to the 4,5-aldrin-*trans*-dihydrodiol was used in addition to the direct oxidation when high liver concentrations had to be reduced.

75-1932. Sifri, M.; Sell, J. L.; Davison, K. L. (Anim. Sci. Dep., North Dakota State Univ., Fargo, ND 58102). **Comparative effects of *p,p'*-DDT and pentobarbital on hepatic microsomal enzymes in young quail, chicks and ducklings** *Comp. Biochem. Physiol.* 51B: 213-219; 1975. (29 references)

Pentobarbital (PB) and DDT effects on microsomal mixed function oxidases of ducklings, quail, and chicks were studied. DDT and PB exerted variable effects on body weight gain, liver to body weight ratio and hepatic microsomal protein concentration in the three species. PB did not affect the enzyme activities, while dietary DDT increased aniline hydroxylase, aminopyrine *N*-demethylase activities and cytochrome P-450 concentration in ducklings. In contrast, DDT inhibited aniline hydroxylase and aminopyrine *N*-demethylase activities in quail and suppressed aniline hydroxylase activity in chicks. Additional data showed that aniline hydroxylase was competitively inhibited by DDT in the chick. (Author abstract by permission)

75-1933. Kishi, D. T. (Univ. California, Sch. Pharm., San Francisco, CA). **Cushing's syndrome.** *Curr. Ther. Concepts* NS15(5): 261-270; 1975. (73 references)

The therapeutic use of TDE in the treatment of Cushing's syndrome is discussed. The daily dose should approximate 10 g/day for 4-6 wk since 86% of patients require a minimum of 4 wk to respond. Tumor regression is the most reliable method of evaluating response to TDE. A 34% response rate in a series of 138 patients treated with TDE was reported. A 35% response rate was noted when subjective symptomatic criteria were evaluated. The average dose required to obtain objective evidence of tumor regression was 8.1 g/day. The adversities of TDE therapy are most frequently associated with the gastrointestinal and neuromuscular systems. Approximately 80% of 138 patients that were treated manifested anorexia, nausea, vomiting, or diarrhea. Diarrhea occurred in 20% of the patients. Lethargy and somnolence appeared in 26% and dizziness and vertigo in 14%. Muscle tremors, headache, confusion, and weakness were also noted. The gastrointestinal and neuromuscular side effects are dose related and are alleviated by discontinuance or reduction in the dose of the drug.

75-1934. Amer, S. M.; Farah, O. R. (Lab. Genet. Cytol., Natl. Res. Cent., Dokki, Cairo, Egypt). **Cytological effects of pesticides. VII. Mitotic effects of isopropyl-*N*-phenylcarbamate and "Duphar".** *Cytologia* 49(1): 21-29; 1974. (19 references)

The effects of *o*-isopropyl-*N*-phenylcarbamate (IPC) and "Duphar" were studied on root-mitosis of *Vicia faba* and *Gossypium barbadense*. Two types of treatments were conducted: seed-soak and root-treatments. The concentrations used were: saturated, 0.5, 0.25, and 0.125, of saturated IPC solution; and for Duphar lower concentrations were used in addition to those mentioned above. Both agents effected a clear decrease in the mitotic index of *Vicia faba* after both seed-soak and root-treatments. Treatments of *Vicia faba* roots with a saturated solution of Duphar proved the most effective treatment; the percentage of abnormal mitoses was much higher than that induced in the case of cotton roots. Roots treated with IPC recovered more rapidly than those treated with Duphar. Disturbed prophases, meta- and anaphases comprised the main type of the induced abnormalities. Lagging chromosomes, multipolar anaphases, chromosome stickiness, anaphase-bridges, chromosome fragmentation, and multinucleated cells were also observed.

75-1935. Abduvakhadov, A. A.; Zuparova, K. M.; Godovikov, N. N.; Kabachnik, M. I.; Krashenyuk, A. I.; Mikhaylov, S. S.; Rozengart, V. I. (Lab. Chem. Natural Compounds, V. I. Lenin Tashkent State Univ., Tashkent,

USSR). **O novykh gidrofobnykh uchastkakh v rayone esteraznogo tsentra kholinesteraz.** [**New hydrophobic regions near the esterase center of cholinesterase.**] *Dokl. Akad. Nauk SSSR* 211(5): 1209-1212; 1973. (6 references) (Russian)

The hydrophobic region in the esterase center of beef erythrocyte acetylcholinesterase and equine serum butylcholinesterase was discovered by the use of three different series of newly synthetized organophosphorus inhibitors with alkyl groups ranging from methyl to *n*-butyl. The strongest acetylcholinesterase-inhibiting effect was shown by organophosphorus compounds in which methyl group was bound to the phosphorus atom. The elongation of the alkyl radical reduced the cholinesterase-inhibiting action, or caused no change at all. In the case of butylcholinesterase, the elongation of the alkyl radical caused considerable increase in the cholinesterase-inhibiting effect. The newly discovered hydrophobic region in the esterase center, assumed not to be identical with those described earlier, is greatly confined, and suitable for the absorption of methyl group only in the case of acetylcholinesterase, but it is more extended in the case of butylcholinesterase.

75-1936. Selivanova, A. S.; Molodykh, Zh. V.; Gamayurova, V. S.; Chernokal'skiy, B. D.; Il'ina, S. V. (Kazan S. M. Kirov Inst. Chem. Technol., Kazan, USSR). **Sintez i izucheniye toskicheskikh svoystv nekotorykh mysh'yakorganicheskikh soyedineniy.** [**Synthesis and study of toxic properties of some organoarsenic compounds.**] *Dokl. Akad. Nauk SSSR* 218(2): 493-496; 1974. (10 references) (Russian)

Studies on the synthesis and toxicity tests of salts of arsonic acids and aliphatic amines are presented. As revealed by animal tests, the LD50 values of diethylammonium phenylarsonate, bis(diethyl-ammonium)-phenylarsonate, and triethylammonium allylarsonate range from 46 to 146 mg/kg, while those of diethylammonium acetylarsanylate, diethylammonium *o*-acetamino-phenylarsonate, triethylammonium *o*-acetylaminophenylarsonate, and morpholine acetylarsanylate range from 2,067 to 5,000 mg/kg. Bis(diethylammonium)-phenylarsonate showed no cumulative property in rats. Piperidine benzylarsonate and diethylammonium acetylarsanylate had no blastomogenic effect on the skin of albino mice. Other compounds were found not to stimulate Ehrlich ascites tumor, while bis(diethylammonium)-phenylarsonate and diethylammonium acetylarsanylate even showed a slight antiblastomogenic effect.

75-1937. Morton, H. L.; Moffett, J. O.; Martin, R. D. (Agric. Res. Serv., USDA, Tucson, AZ 85719). **Influence of water treated artificially with herbicides on honey bee colonies.** *Environ. Entomol.* 3(5): 303-312; 1974. (11 references)

Apis mellifera L. colonies were placed in isolated desert apiaries where their only source of water contained paraquat (concentration of 1000 parts per million active ingredient by weight (ppmw). Large numbers of bees exposed to paraquat died immediately, and all were dead before the end of the 5th week. When colonies were similarly exposed to like amounts of 2,4,5-T, large numbers of bees drowned in the water because of the lower surface tension of the water, and production of brood was reduced below that of check colonies during the period the treated water was used and for 3 months thereafter; however, in the subsequent 9 months, production returned to normal. Concentrations of 2,4,5-T in honey bees from colonies using water containing 2,4,5-T were as high as 148 ppmw, but this level dropped to about 5 ppmw as soon as the bees began using untreated water. Likewise, honey from colonies using water containing 2,4,5-T contained concentrations of 2,4,5-T as high as 50 ppmw; however, the concentration dropped to about 5.0 ppmw within 1 week after the bees began using untreated water. The last day when any 2,4,5-T was detected in honey bees and honey from treated colonies was 480 days after the experiment began. Wax from colonies using the treated water contained detectable amounts of 2,4,5-T 650 days after the study was initiated. (Author abstract by permission)

75-1938. Tooby, T. E.; Durbin, F. J. (Salmon Freshwater Fisheries Lab., Ministry Agric., Fisheries Food, London, England). **Lindane residue accumulation and elimination in rainbow trout (*Salmo gairdnerii* Richardson) and roach (*Rutilus rutilus* Linnaeus).** *Environ. Pollut.* 8(2): 79-89; 1975. (16 references)

Pesticide concentrations in the tissues were determined after chronic lethal exposure of yearling rainbow trout to lindane and after acute lethal exposure of rainbow trout fry and adult roach fish to lindane. In other experiments, the rate of residue accumulation and loss was determined in fish exposed to lindane then placed in clean water; and tissue residues were compared in fish killed by lindane in the laboratory and wild fish found dead after suspected lindane poisoning. Lindane accumulation was rapid in both trout and roach, and when they were exposed to a lethal concentration, the residues found after a quarter of the median survival time fell within the lethal range. After chronic exposure to lindane, the residue accumulation in the muscle, liver, and brain reached a steady rate after 4 days; the residues were rapidly lost from all 3 tissues when the fish were returned to clean water, control levels being reached ater 30-50 days. In both species, there was a definite tissue residue concentration associated with death, and this concentration was independent of time of exposure or concentration of lindane in the environment.

75-1939. Main, A. R. (Sch. Agric. Life Sci., North Carolina State Univ., Raleigh, NC). **Kinetics of active-site directed irreversible inhibition.** *IN: Essays in Toxicology*, W. L. Hayes Jr., ed., Academic Press, New York, 1973, p. 59-105. (66 references)

The central core around which a reasonable kinetic treatment of active-site directed irreversible enzyme inhibition can be constructed is the reaction scheme according to which an enzyme combines with an inhibitor composed of a remaining group and a leaving group to form an enzyme-inhibitor binding complex of the Michaelis type, then a covalent bond forms irreversibly between the enzyme and the remaining group. An equilibrium affinity constant governs the formation of the binding complex, and the rate of covalent bond formation is governed by another rate constant. This scheme leads to rather simple kinetic treatment for organophsophate and carbamate cholinesterase inhibitors. The interaction of DFP with cholinesterase was the first example of active-site directed irreversible inhibition discussed, although the existence of a reversible affinity complex with DFP was only recently demonstrated. The toxicity of organophosphate and carbamate compounds is directly related to their high cholinesterase inhibition rates. Kinetic analysis permits the structural features of the inhibitor involved in binding to be separated from those concerned with covalent bond formation, and may thus aid in the design of more selective or more powerful inhibitors.

75-1940. Blair, D.; Rees, H. J. (Shell Res. Ltd, Tunstall Lab., Sittingbourne, Kent, England). **The generation and administration of atmospheres containing dichlorvos for inhalation studies.** *Am. Ind. Hyg. Assoc. J.* 36(5): 385-397; 1975. (22 references)

The generation and administration of atmospheres containing dichlorvos for both short term and long term exposure of animals and man are described. The column bleed phenomenon of gas chromatography was adapted to dichlorvos generation using graphitized carbon granules of 2-3 mm diameter coated with liquid dichlorvos. If a smaller resistance to flow is desirable, the porous carbon packing can be replaced by a series of glass-fiber wicks to give a more open flow structure. The administration of dichlorvos atmospheres to rabbits and rats is described. Two different levels of dichlorvos concentrations were used for the exposure of human subjects. In the low level experiments the subjects were placed in a 20 m^3 exposure chamber and the generated atmosphere was drawn through the chamber at a flow rate of 5.7 m^3/min. The concentration of dichlorvos was about 1 μg/l. For the exposure of human subjects to dichlorvos concentrations of 10-50 μg/l the inhalation chamber was used purely to house the subject and to remove excess atmosphere supplied to the subject. The atmosphere itself was confined to the breathing zone of the subject by a mask or an inhalation hood.

75-1941. Waritz, R. S.; Brown, R. M. (Haskell Lab., Cent. Res. Dep., E. I. du Pont de Nemours and Co., Wilmington, DE 19898). **Acute and subacute inhalation toxicities of phosphine, pheylphosphine and triphenylphosphine.** *Am. Ind. Hyg. Assoc. J.* 36(6): 452-458; 1975. (16 references)

The four-hour LC50 values for ChR-CD male rats for phosphine, phenylphosphine, and triphenylphosphine have been determined to be 0.44 μM/l, 1.56 μM/l, and 47.8 μM/l, respectively. The dose-death curves are parallel. During exposure, all three caused clinical signs indicative of mild respiratory irritation. Triphenylphosphine also caused severe weight loss immediately after exposure, followed by normal rate of weight gain. No histopathologic effects due to exposure were seen in any of the tissue examined after single exposures to any of the three compounds. Phosphine and triphenylphosphine caused mild weight loss during a 10-day exposure period followed by normal rate of weight gain during a 14-day recovery period. The phenylphosphine exposures caused a decreased rate of weight gain during the exposure period which returned to normal during the recovery period. Silver nitrate paper was found to be unsuitable for field analysis of phenylphosphine. (Author abstract by permission)

75-1942. Uchiyama, M.; Yoshida, T.; Homma, K.; Hongo, T. (Pharm. Inst., Tohoku Univ., Aobayama, Sendai, Japan). **Inhibition of hepatic drug-metabolizing enzymes by thiophosphate insecticides and its drug toxicological implications.** *Biochem. Pharmacol.* 24: 1221-1225; 1975. (15 references)

Thiophosphate insecticides—fenitrothion, diazinon and methylparathion—inhibit hepatic drug-metabolizing enzyme activity, which was assayed using aminopyrine and aniline as substrates. About 50 per cent inhibition was noted 4 hr after the injection of 25 mg/kg of fenitrothion into mice. The addition of thiophosphates to a microsomal drug-metabolizing enzyme system in vitro also produced an effective inhibition: IC50 was ca 1μM for fenitrothion. DDVP and an oxygenated metabolite of fenitrothion did not show any inhibiting effect either in vitro or in vivo. The inhibition in vitro was competitive, while the kinetics of inhibition in vivo appeared to be noncompetitive. Drug metabolism by a rat liver preparation was also inhibited by thiophosphate in vitro, but treatment of male rats in vivo resulted in little inhibition. The responses of female rats were similar to those of mice. The administration of fenitrothion to mice prolonged the hexobarbital sleeping time and suppressed the oxidative metabolism of parathion in liver preparations. (Author abstract by permission)

75-1943. Akkermans, L. M. A.; Van Den Bercken, J.; Van Der Zalm, J. M. (Inst. Vet. Pharmacol. Toxicol., Univ. Utrecht, The Netherlands). **Effects of aldrin-transdiol on neuromuscular facilitation and depression.** *Eur. J. Pharmacol.* 31(2): 166-175; 1975. (42 references)

The effects of aldrin-transdiol on evoked transmitter release, neuromuscular facilitation, and neuromuscular depression were studied in frog sartorius nerve-muscle preparations. Conventional techniques of intracellular recording were used. Aldrin-transdiol caused a marked increase in end-plate potential amplitude under conditions of

low quantal content, i.e., in Mg^{2+}-blocked junctions. The increase in end-plate potential amplitude was less pronounced in curarized junctions, in which the transmitter release was not impaired. Concomitant with the increase in end-plate potential size there was a marked enhancement of facilitation during short trains of stimuli applied to the motor nerve. The decay of facilitation was, however, not seriously affected by aldrin-transdiol. These effects may be explained by assuming that aldrin-transdiol increases the amount of calcium which enters the nerve terminal during the nerve impulse. The increase in end-plate potential amplitude and in facilitation by aldrin-transdiol was transient. At later stages of poisoning, end-plate potential and facilitation decreased below control level and neuromuscular depression was significantly enhanced. This latter effect may be the result of a direct inhibitory effect of aldrin-transdiol on transmitter mobilization. As far as the fall in end-plate potential amplitude is concerned, the known suppressive action of aldrin-transdiol on the chemical sensitivity of the postsynaptic membrane and on the nerve action potential probably plays a part as well. Finally, neuromuscular transmission was completely blocked by aldrin-transdiol.

75-1944. Laskowski, M. B.; Olson, W. H.; Dettbarn, W. D. (Dep. Pharmacol., Vanderbilt Univ. Sch. Med., Nashville, TN 37232). **Ultrastructural changes at the motor end-plate produced by an irreversible cholinesterase inhibitor.** *Exp. Neurol.* 47(2): 290-306; 1975. (16 references)

Sprague-Dawley rats were injected i.p. with paraoxon once a day for up to 5 days. On the first day. 0.5 mg/kg was given as a saline solution of 0.25 mg/ml. Five to 10 min after injection the animals began to display symptoms indicating cholinesterase inhibition such as muscle twitching, salivation, diarrhea, and whole body tremor. Animals showing severe symptoms were selected for chronic treatment. On the second through the fifth days, a single injection of 0.5 mg/kg was usually lethal. Thus a lower dose of 0.1 to 0.2 mg/kg paraoxon was given 2 or 3 times until severe symptoms were produced. Paraoxon produced a progressive myopathy in rat diaphragm, soleus, and gastrocnemius muscles. Diaphragms of rats killed after 2 and 5 days of i.p. injections showed a cholinesterase activity less than 35% of control, and ultrastructural examination of the motor end-plates showed wide variations in altered structure. After 2 days of paraoxon treatment, some nerve terminals contained many coated vesicles and swollen mitochondria. The subsynaptic folds usually contained cleft vesicles of varying size. The muscle directly beneath the subsynaptic folds lost its cytoarchitectural organization and often contained large vacuoles whereas the region of muscle away from the motor end-plate was relatively unaffected. The abnormalities were more severe after 5 days of paraoxon treatment. Within the same paraoxon-treated diaphragm some end-plates were nearly normal while others were severely abnormal. The observations of this study indicate that paraoxon, an irreversible inhibitor of cholinesterase, produces a progressive myopathy which is primarly associated with the motor end-plate region.

75-1945. Gaillard, D.; Mitjavila, S.; Derache, R. (Groupe Rech. Toxicol. Aliments et Boissons, Inst. Physiol., Toulouse, France). **Activite enzymatique, au niveau des microsomes hepatiques du rat, apres administration d'acides phenoliques. [Enzymatic activity in rat liver microsomes after administration of phenolic acids.]** *Food Cosmet. Toxicol.* 12(3): 303-311; 1974.

Enzyme activity at the level of the hepatic microsomes has been evaluated after treatment of female rats with gallic acid, ethyl gallate, syringic acid, veratric acid, vanillic acid or 3,4,5-trimethoxybenzoic acid. These substances, administered ip in a dose of 150 mg/kg/day at 24-hr intervals for 4 days, had no effect on microsomal-enzyme activity. In contrast, tannic acid given in a dose of 25 mg/kg/day for 4 days caused a significant inhibition of aniline hydroxylation and amidopyrine *N*-demethylation but had no significant effect on *p*-nitroanisole *O*-demethylation or the concentration of cytochrome P-450. At the same time, pentobarbitone sleeping was prolonged in vivo in the treated rats. These results indicate a change at the subcellular level under the conditions of the experiment, and this was supported by a reduction in the level of microsomal protein. However, after oral administration of tannic acid in a dose of 500 mg/kg/day for 4 days, there was no change in microsomal enzyme activity. (Author abstract by permission)

75-1946. Toor, H. S.; Kaur, K. (Dep. Zool., Punjab Agric. Univ., Ludhiana, India). **Toxicity of pesticides to the fish, *Cyprinus carpio communis* Linn.** *Indian J. Exp. Biol.* 12(4): 334-336; 1974. (14 references)

Observations on the toxicity of carbaryl, diazinon, phosphamidon, and fenitrothion to *Cyprinus carpio communis* Linn. were made by employing bioassay techniques. The pesticides can be arranged in the order of increasing toxicity as: phosphamidon, carbaryl, diazinon, and fenitrothion, the last three being about 16, 52, and 71 times more toxic than phosphamidon. To control pollution of natural water bodies it is essential to recommended that tested pesticides in effluents from agricultural fields and other places should not exceed the safe concentrations. Safe concentrations of carbaryl, diazinon, phosphamidon, and fenitrothion for *C. carpio communis* were computed to be 2.66, 0.92, and 0.45 ppm, respectively.

75-1947. Gupta, B.; Agarwal, H. C. (Dep. Zool., Univ. Delhi, Delhi, India). **Metabolism and distribution of DDT in mouse in relation to poisoning symptoms.** *Indian J. Exp. Biol.* 12(5): 402-405; 1974. (20 references)

Adult male laboratory Swiss albino mice were given 1400 mg DDT/kg as a s.c. injection of 10% *p,p'*-DDT in peanut oil (wt/vol). The metabolism of DDT in various tissues was studied after 24 and 48 hr. The major metabo-

lite found in almost all tissues was *p,p'*-DDE. TDE was detected mainly in the liver. No other metabolites were detected. For DDT distribution studies the treated animals were divided into 6 categories according to symptoms of poisoning. The concentration of DDT was determined in brain, spinal cord, liver, kidney, and adipose tissue. DDT concentration in the tissues increased with time and severity of poisoning symptoms. The brain and the spinal cord contained the lowest amounts of DDT, 11.4 and 12.3 ppm respectively, when the mice showed no symptoms. The DDT concentrations were increased to 61.8 and 68.6 ppm in the mice which died, and they were reduced to 14.7 and 26.0 ppm respectively, in mice which recovered. In adipose tissue the DDT concentration continued to increase steadily, and it was maximal in mice which had recovered. The results indicate that poisoning symptoms were directly related to the concentration of DDT in the brain and the spinal cord. The DDT concentration in the brain and spinal cord of mice at the time of death was on the same order of magnitude as that found in rats, catfish and a few species of birds under identical conditions.

75-1948. Miyazaki, S.; Sikka, H. C.*; Lynch, R. S. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY 13210). **Metabolism of dichlobenil by microorganisms in the aquatic environment.** *J. Agric. Food Chem.* 23(3): 365-368; 1975. (16 references)

The metabolism of [^{14}C]nitrile-labeled dichlobenil (2,6-dichlorobenzonitrile) by a microbial population in pond water and bottom sediment as well as by a pure culture of a bacterium isolated from the hydrosoil was investigated. More than 75% of dichlobenil added to water and sediment diappeared due primarily to volatilization of the herbicide. Dichlobenil was converted microbiologically to 2,6-dichlorobenzamide and certain unknown metabolites in the water and sediment. The radioactivity remaining in the sediment after methanol and HCl extractions varied from 3 to 5% of the originally applied ^{14}C. A cell suspension of an *Arthrobacter* sp. metabolized as much as 71% of dichlobenil to dichlorobenzamide during a 6-day incubation period, but produced very small amounts of other metabolites. When [^{14}C]amide-labeled dichlorobenzamide was incubated in water and sediment, about 6% of ^{14}C was converted to $^{14}CO_2$ 39 days after treatment. It appears that in the aquatic environment, dichlobenil can be metabolized to CO_2 via dichlorobenzamide primarily through microbiological action. (Author abstract reprinted by permission of the American Chemical Society)

75-1949. Feung, C. S.; Hamilton, R. H.; Mumma, R. O.* (Dep. Entomol. and Biol., Pennsylvania State Univ., University Park, PA 16802). **Metabolism of 2,4-dichlorophenoxyacetic acid. VIII. Comparison of metabolites from five species of plant callus tissue cultures.** *J. Agric. Food Chem.* 23(3): 373-376; 1975. (15 references)

The metabolism of 2,4-dichlorophenoxyacetic acid (2,4-D) was investigated in carrot, jackbean, sunflower, tobacco, and corn callus tissue. Amino acid conjugates and hydroxylated metabolites were identified in all plant species although in varying amounts. After 8 days of incubation with 2,4-D water-soluble metabolites were formed in the callus tissue as follows: carrots (13.2%), jackbean (12.8%), sunflower (18.3%), tobacco (42.2%), and corn (64.6%). Five metabolites were identified as aglycones after treatment of these water-soluble fractions with β-glucosidase, three of which were present in all plants, 4-hydroxy-2,3-dichlorophenoxyacetic acid, 4-hydroxy-2,5-dichlorophenoxyacetic acid, and 2,4-D. Two tentatively identified aglycone metabolites, 3-hydroxy-2,4-dichlorophenoxyacetic acid (major) and 4-hydroxy-2-chlorophenoxyacetic acid (minor), were present only in corn. Glutamic acid was identified conjugated with 2,4-D in all tissues examined. The aspartic acid conjugate was present in corn, tobacco, and jackbean. Corn, the only monocot examined, was somewhat unusual since it possessed a high percentage of hydroxylated metabolites, including two not found in the other plant species. (Author abstract reprinted by permission of the American Chemical Society)

75-1950. Blevins, R. D.; Dunn, W. C., Jr. (East Tennessee State Univ., Johnson City, TN 37601). **Effects of carbaryl and dieldrin on the growth, protein content, and phospholipid content of HeLa cells.** *J. Agric. Food Chem.* 23(3): 377-382; 1975. (30 references)

Monolayer cultures of HeLa were used to monitor the effects of two commonly used insecticides on cell numbers, protein content, and phospholipid content. Analytical grades of carbaryl (a carbamate insecticide) and dieldrin (an organochlorine insecticide) were used in the study. HeLa cells were incubated for 48 hr with different concentrations (1, 2, 4, and 8 ppm) of the selected chemicals. Both carbaryl and dieldrin were found to stimulate cell division at 1 and 2 ppm and to inhibit growth at 4 and 8 ppm. Carbaryl was found to be more toxic than dieldrin at 4 and 8 ppm. A decrease in cellular protein was noted with carbaryl at 4 ppm and with dieldrin at 4 and 8 ppm. Increasing concentrations of carbaryl caused subsequent increases in sphingomyelin content of the phospholipid fractions of exposed cells. Both carbaryl and dieldrin elicited decreases in the amounts of phosphatidylcholine, and a slight increase in lysophosphatidylcholine was noted in cells exposed to carbaryl. The results indicate that carbaryl and dieldrin caused general metabolic changes in HeLa cells. The variations in phospholipid content of HeLa cells caused by carbaryl and dieldrin suggest an alteration of the structure of cellular membranes. (Author abstract reprinted by permission of the American Chemical Society)

75-1951. Feil, V. J.; Lamoureux, C. H.; Zaylskie, R. G. (Agric. Res. Serv., Metab. and Radiat. Res. Lab., Fargo, ND 58102). **Metabolism of *o,p'*-DDT in chickens.** *J. Agric. Food Chem.* 23(3): 382-388; 1975. (9 references)

The following metabolites were identified in chicken excreta after dosing with *o,p'*-DDT-^{14}C: *o,p'*-DDD; *o,p'*-DDT; 3-hydroxy-2,4-DDD; 3-hydroxy-2,4'-DDT; 4-hydroxy-3-methoxy-2,4'-DDD; 4-hydroxy-3-methoxy-2,4'-DDT; *o,p'*-DDA; 3-hydroxy-2,4'-DDA; 4-hydroxy-3-methoxy-2,4'-DDA; *o,p'*-DDE; 3-hydroxy-2,4'-DDE; 4-hydroxy-3-methoxy-2,4'-DDE; 4-hydroxy-2,4'-DDE; the methyl ester of *o,p'*-DDA; the methyl ester of a methoxy-2,4'-DDA (probably the 3 isomer); and 4-hydroxy-2,4'-DDD. A significant species difference was found in the metabolism of *o,p'*-DDT; chickens metabolized *o,p'*-DDT to four DDE-type compounds, whereas rats did not. (Author abstract reprinted by permission of the American Chemical Society)

75-1952. Larsen, G. L.; Bakke, J. E. (Agric. Res. Serv., Metab. Radiat. Res. Lab., Fargo, ND 58102). **Metabolism of cyprazine in the rat.** *J. Agric. Food Chem.* 23(3): 388-392; 1975. (6 references)

Rats given single oral doses of ring-^{14}C-labeled cyprazine (I) excreted 97.6% of the dose within 72 hr (urine, 72.7%; feces, 24.9%). Less than 0.1% of the radioactivity was detected as $^{14}CO_2$ in the expired air. The rat carcasses contained 7.5% of the radioactivity at sacrifice (72 hr after dosing). Four urinary metabolites were identified by comparison of their mass spectra with those of authentic compounds. These compounds and the percentage of the urinary radioactivity that they represented were: 2-hydroxy-4,6-diamino-*s*-triazine (II, 3.0%); 2-chloro-4,6-diamino-*s*-triazine (III, 13.9%); 2-hydroxy-4-amino-6-isopropylamino-*s*-triazine (IV, 5.3%); and 2-chloro-4-amino-6-isopropylamino-*s*-triazine (VII, 2.1%). Two fecal metabolites were identified as II and IV. Four additional urinary metabolites were characterized by mass spectrometry as s-triazine (V, 5.9%); 2-chloro-4-amino-6-cyclopropylamino-*s*-triazine (VI, 7.7%); VIII, 9.9%; and 2-chloro-4-cyclopropylamino-6-[(2-hydroxy-1-methylethyl)amino]-*s*-triazine (IX, 1.6%). (Author abstract reprinted by permission of the American Chemical Society)

75-1953. Cecil, H. C.; Harris, S. J.; Bitman, J.; Reynolds, P. (Agric. Res. Serv., Agric. Res. Cent.-East, Beltsville, MD 20705). **Estrogenic effects and liver microsomal enzyme activity of technical methoxychlor and technical 1,1,1-trichloro-1-bis(*p*-chlorophenyl)ethane in sheep.** *J. Agric. Food Chem.* 23(3): 401-403; 1975. (24 references)

Crossbred yearling ewes were fed ad libitum for 10 or 16 weeks a control diet or a pelleted ration containing 250 ppm of technical 1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)ethane (DDT) or 250, 1000, or 2500 ppm of technical methoxychlor (MeOCl). There were no differences in food consumption, body weight, liver weight, or uterine weight, water and glycogen. Examination of ovaries indicated that all animals were cycling. All treatments significantly increased liver microsomal enzyme activity. Although MeOCl was fed at 10X the DDT level, liver enzyme activity was less than with DDT. Demethylase activity was 5X control in DDT-treated sheep and 2-3X control in MeOCl-treated sheep. Hydroxylase activity was 2X control in DDT-treated sheep and 1.5X control in MeOCl-treated sheep. (Author abstract reprinted by permission of the American Chemical Society)

75-1954. Peeters, J. F.; Van Rossen, A. R.; Heremans, K. A.; Delcambe, L. (Dep. Chem., Katholieke Univ. Leuven, B-3030 Heverlee, Belgium). **Influence of pesticides on the presence and activity of nitrogenase in *Azotobacter vinelandii*.** *J. Agric. Food Chem.* 23(3): 404-406; 1975. (17 references)

The influence of various pesticides on the growth of *Azotobacter vinelandii* was tested under nitrogen fixing conditions. Growth was stimulated in nearly all cases. The presence of nitrogenase in bacterial extracts was greatly reduced. Inhibition experiments showed that organochlorine compounds have no influence on the reduction of acetylene. Derivatives of 2,4-dinitrophenol inhibit in a specific way. (Author abstract reprinted by permission of the American Chemical Society)

75-1955. Hendrickson, C. M.; Bowden, J. A. (Dep. Biochem., Louisiana State Univ., Baton Rouge, LA 70803). **The in vitro inhibition of rabbit muscle lactate dehydrogenase by mirex and kepone.** *J. Agric. Food Chem.* 23(3): 407-409; 1975. (29 references)

Mirex, a polychlorinated pesticide used for fire ant control in the southern United States, accumulates in many species inhabiting treated areas. Because the LD50 of Mirex in many species is very high, it was thought that accumulation levels represented no hazard to species which might be naturally exposed, since these accumulated Mirex concentrations were well below typical lethal doses. However, it was found that lactate dehydrogenase (EC 1.1.1.27, crystalline from rabbit muscle) is competitively inhibited by Mirex and by Kepone (a carbonyl analog of Mirex) at levels as low as 0.01 m*M* (10 ppm) during in vitro determinations. This inhibition occurs at test levels well below usual lethal dosages and comparable to accumulation concentrations. Because lactate dehydrogenase occupies a key position in the anaerobic glycolytic pathway of skeletal muscle (one of several tissues which accumulates Mirex), impairment of the function of this enzyme in energy production could result in possible harmful effect on muscle function. (Author abstract reprinted by permission of the American Chemical Society)

75-1956. Olson, L. E.; Allen, J. L.; Mauck, W. L. (U. S. Dep. Inter. Fish and Wildl. Serv., Fish Pestic. Res. Unit, La Crosse, WI 54601). **Dinitramine: residues in and toxicity to freshwater fish.** *J. Agric. Food Chem.* 23(3): 437-439; 1975. (13 references)

Dinitramine, a herbicide registered for use on cotton and soybeans, is toxic and accumulates in fish tissue after brief exposures to low concentrations. The 96-hr LC_{50} values for several species of coldwater and warmwater fish ranged from 0.590 to 1.52 mg/l. at 12°. Muscle, plasma, and gallbladder bile of carp (*Cyprinus carpio*) and channel catfish (*Ictalurus punctatus*) were examined for uptake and retention of dinitramine after a 12-hr exposure to a 1 mg/l. concentration. Accumulation in tissues analyzed exceeded the exposure concentration in all instances, and the herbicide was not completely eliminated after the fish had been held in fresh water for 24 hr. (Author abstract reprinted by permission of the American Chemical Society)

75-1957. Clark, D. E.; Palmer, J. S.; Radeleff, R. D.; Crookshank, H. R.; Farr, F. M. (Vet. Toxicol. Entomol. Res. Lab., Agric. Res. Serv., College Station, TX 77840). **Residues of chlorophenoxy acid herbicides and their phenolic metabolites in tissues of sheep and cattle.** *J. Agric. Food Chem.* 23(3): 573-578; 1975. (13 references)

Three chlorophenoxy acid herbicides, 2,4-D, 2,4,5-T, and silvex, were fed at four dosage levels (0, 300, 1000, and 2000 ppm) to adult sheep and cattle for 28 days. Some were killed and tissues were sampled 1 day after the last dose, others 1 week later. Residues of the chlorophenoxy acid herbicides and their phenol metabolites were determined in muscle, fat, liver, and kidney. Analytical methods for determining tissue residues of chlorophenoxy acids and chlorophenols are presented. Muscle and fat contained the least residues of the herbicides or their metabolites. Kidneys contained the highest residues of each of the three herbicides. Liver and kidney contained the highest levels of either 2,4-dichlorophenol or 2,4,5-trichlorophenol. Withdrawal from treatment for 1 week before killing resulted in significant reduction in tissue residue levels. No species difference in regard to chlorophenoxy herbicide residue deposition was observed. Anorexia, either partial or complete, accompanied by decreased weight gains was observed, especially at the highest dosage levels. (Author abstract by permission of the American Chemical Society)

75-1958. Yih, R. Y.; Swithenbank, C. (Res. Lab., Rohm and Haas Co., Spring House, PA 19477). **New potent diphenyl ether herbicides.** *J. Agric. Food Chem.* 23(3): 592-593; 1975. (3 references)

Structural modification of the previously known diphenyl ether herbicides has resulted in new analogs (2-chloro-4-trifluoromethylphenyl 4-nitrophenyl ether and 2-chloro-4-trifluoromethylphenyl 3-ethoxy-4-nitrophenyl ether) which are unexpectedly tenfold more active for weed control, and possess potential commercial agricultural utility in soybean, cotton, peanuts, sunflower, wheat, and rice and for total weed control. (Author abstract reprinted by permission of the American Chemical Society Supplemented)

75-1959. Truhaut, R.; Gak, J. C.; Graillot, C. (Lab. Toxicol. Hyg. Ind., Universite Rene-Descartes, Paris, France). **Recherches sur les modalites et les mecanismes d'action toxique des insecticides organochlores. I. Etude comparative des effets de toxicite aigue chez le hamster et chez le rat. [Study of the modalities and action mechanisms of organochlorine insecticides. I. Comparative study of the acute toxicity in hamster and rat.]** *J. Eur. Toxicol.* 7(3): 159-166; 1974. (12 references) (French)

A comparative histochemical and histological study is described of hamsters and rats with acute poisoning by DDD (TDE) *p,p'*-DDT, as well as technical-grade DDT, aldrin, dieldrin, chlordane, heptachlor, lindane, and endosulfan. The pesticides were administered in neutralized olive oil through a stomach tube. The LD50 values were determined to be 215 mg/kg for DDT, 120 mg/kg for *p,p'*-DDT, 3,750 mg/kg for DDT, 350 mg/kg for chlordane, 105 mg/kg for heptachlor, 45 mg/kg for dieldrin, 37.5 mg/kg for aldrin, 100 mg/kg for lindane, and 64 mg/kg for endosulfan in rats. The corresponding values for hamsters are $\rangle$ 10,000 mg/kg, $\rangle$ 5,000 mg/kg, $\rangle$ 5,000 mg/kg, 1,720 mg/kg, 100 mg/kg, 330 mg/kg, 320 mg/kg, 360 mg/kg, and 118 mg/kg. The LD0 values are 100 mg/kg for technical DDT, 50 mg/kg for *p,p'*-DDT, 2,000 mg/kg for DDD, 200 mg/kg for chlordane, 40 mg/kg for heptachlor, 30 mg/kg for dieldrin, 20 mg/kg for aldrin, 50 mg/kg for lindane, and 40 mg/kg for endosulfan in rats. The corresponding values determined for hamsters are 10,000; 4,000; 5,000; 1,200; 40; 200; 200; 200, and 70 mg/kg. The above doses caused significant increase in the serum SGPT and LDH activities in the rats, and chlordane significantly reduced the serum cholinesterase activity. The SGPT, alkaline phosphatase, and LDH activities showed no change in hamsters, while the serum cholinesterase activity decreased by about 50%. Considerable reduction of the hepatic glucose-6-phosphate dehydrogenase activity in rats, and pronounced increase in this activity in hamsters were observed. Despite the hypertrophy of the liver, there was no significant change in the weights of the testes, kidneys, and adrenals. No significant histological changes were found in the lungs, heart, spleen, intestines, testes, and adrenals. Congestion and degenerative lesions were frequent in the liver.

75-1960. Mehrle, P. M.; Mayer, F. L., Jr. (Fish-Pestic. Res. Lab., U. S. Dep. Inter., Fish Wildl. Serv., Columbia, MO 65201). **Toxaphene effects on growth and bone composition of fathead minnows *Pimephales promelas*.** *J. Fish. Res. Bd. Can.* 32(5): 593-598; 1975. (23 references)

Fathead minnows (*Pimephales promelas*) were exposed to toxaphene (55-1230 ng/liter) in a flow-through diluter system for 150 days. Growth was not affected by toxaphene for up to 90 days of exposure, but within 150 days it was significantly reduced at all concentrations. Collagen content of the backbone was decreased ($P \langle 0.05$), amino acid composition was changed, and calcium concentration was increased. Results from this study suggest that toxaphene altered the development and quality of the backbone, and induced biochemical manifesta-

tions of the "broken-back" syndrome. Radiographic analyses of the fish support our hypothesis that toxaphene induced a weakened, fragile backbone. (Author abstract by permission)

75-1961. Mehrle, P. M.; Mayer, F. L., Jr. (Fish-Pestic. Res. Lab., U. S. Dep. Inter., Fish and Wildl. Serv., Columbia, MO 65201). **Toxaphene effects on growth and development of brook trout (*Salvelinus fontinalis*).** *J. Fish. Res. Bd. Can.* 32(5): 609-613; 1975. (19 references)

Twenty-two days before hatching, eyed eggs of brook trout (*Salvelinus fontinalis*) were placed in a flow-through system and continuously exposed to toxaphene (0, 39, 68, 139, 88, and 502 ng/liter) until they hatched and the resulting fry were exposed for a further 90 days. Hatchability was not affected by toxaphene, but all of the fry exposed to 502 and 288 ng/liter of toxaphene died by 30 and 60 days after hatch, respectively. Growth of fry was significantly depressed at the 139 and 288 ng/liter concentrations 30 days after hatch and at all concentrations after 60 and 90 days of toxaphene exposure. Whole body collagen of fry, as estimated by hydroxyproline, was significantly decreased in the four higher concentrations of toxaphene within 7-15 days after hatch. Backbone collagen was significantly decreased ($P \rangle 0.05$) in 30-, 60-, and 90-day-old fry exposed to toxaphene, whereas calcium and phosphorus concentrations in the backbone were increased ($P \rangle 0.05$). The mineral:collagen ratio was significantly increased by toxaphene. The whole body collagen of sac-fry was a good predictor of later growth and development of brook trout. (Author abstract by permission)

75-1962. McNicholl, P. G.; Mackay, W. C. (Dep. Zool., Univ. Alberta, Edmonton, Alberta, Canada). **Effects of DDT and M. S. 222 on learning a simple conditioned response in rainbow trout (*Salmo gairdneri*).** *J. Fish. Res. Bd. Can.* 32(5): 661-665; 1975. (33 references)

Rainbow trout (*Salmo gairdneri*) were force fed, with and without M.S. 222 anesthesia, pellets containing DDT equivalent to 0, 10, and 100% of the 96 hr-LD50 dose of 0.03 mg DDT/g body weight. DDT at the LD50 dose significantly increased learning rate 48 and 72 hr after treatment. Although the 10% LD50 group did not learn significantly faster than controls, their slightly improved learning rate indicated a dose-dependent response curve. M.S. 222 did not affect learning rate of a simple conditioned response whether or not the anesthetic was combined with DDT. (Author abstract by permission)

75-1963. Boyle, W. S.; Evans, J. O. (Dep. Biol., Utah State Univ., Logan, UT 84322). **Effects of glyphosate and ethephon on meiotic chromosomes of *Secale cereale* L.** *J. Hered.* 65(4): 250; 1974. (4 references)

Caryopses of fall rye (*Secale cereale* L.) were planted outdoors in September, over-wintered, and seedlings permitted to reach anthesis in the spring. Culms containing young spikes in early boot stage were hand-sprayed with solutions of glyphosate at 1/4 lb ae/A and examined after 50 hr or at 1/2 lb ae/A and examined after 5 days. At the latter concentration glyphosate induced a substantial amount of clumping of bivalents (25%) and unsynchronized divisions (6%). Laggards, fragments, and micronuclei were also present but in low frequency. Cytogenic effects in other plants and tissues may be quite different.

75-1964. Langenbach, R.; Gingell, R. (Eppley Inst. Res. Cancer, Univ. Nebraska Med. Cent., Omaha, NB 68105). **Cytotoxic and oncogenic activities of 1,1,1,-trichloro-2,2-bis(*p*-chlorophenyl)-ethane and metabolites to mouse embryo cells in culture.** *J. Natl. Cancer Inst.* 54(4): 981-983; 1975. (14 references)

The cytotoxic and oncogenic activities of DDT and its metabolites were studied at various equimolar concentrations in an in vitro mouse embryo cell culture system that was malignantly transformable. Cells treated with the solvent DMSO and a known carcinogen, DMBA, were also studied. DDD (TDE) was slightly more cytotoxic than the other compounds and was the most active transforming agent. DDT and DDE showed increasing transformation frequency with higher concentration; however, both compounds were less active than DDD at all concentrations tested. Although DMBA produced a large percentage of highly malignant type III foci (foci which are extremely dense, crisscrossed colonies, and highly tumorigenic when inoculated), no foci caused by DDT or its metabolites possessed the type III morphology. The foci produced by these compounds were distributed equally between types I and II morphologies. These cells had a 30-50% higher saturation density than the parent cells, suggesting that foci formation was not due to transient cytotoxic effects. Cells transformed by DDT and its metabolites were not tumorigenic in any inoculated mice. Thus, DDT, DDE, DDD, or DDA cannot be designated strongly oncogenic according to this assay.

75-1965. Reif, V. D.; Sinsheimer, J. E.; Ward, J. C.; Schteingart, D. E. (Coll. Pharmacol., Univ. Michigan, Ann Arbor, MI 48104). **Aromatic hydroxylation and alkyl oxidation in metabolism of mitotane (*o,p'*-DDD) in humans.** *J. Pharm. Sci.* 63(11): 1730-1736; 1974. (25 references)

The detection and identification of the metabolites of TDE in urine of patients with adrenal cortical carcinoma being treated with TDE are reported. Ether extracts of urine were methylated with diazomethane. Five derivatives or metabolites were detected and identified by comparison of gas liquid chromatographic retention times, mass spectra, and infrared spectra with synthetic reference compounds. The derivatives are methyl *o,p'*-dichlorodiphenylacetate, methyl 1-(2-chloro - 4 - methoxy-phenyl) - 1 - (4-chlorophenyl) acetate, methyl 1-(2-chloro-3-methoxy-phenyl)-1-(4-chlorophenyl) acetate, methyl 1-(2-chloro - 3,4 - dimethoxy) - 1 - (4-chlorophenyl) acetate, and *o,p'*-dichlorodiphenyl - acetylglycine methyl ester. The synthesis and mass, in-

frared, and nuclear magnetic resonance spectra of reference compounds are included. Metabolite levels over a period of time in urine samples of two patients were quantitated by gas liquid chromatography.

75-1966. Morgan, H. K.; Shaw, S. M.; Christian, J. E.; Carlton, W. W. (Dep. Bionucleonics, Sch. Pharm. Pharm. Sci., Purdue Univ., West Lafayette, IN 47907). **Inhalation of 2,3,5-triiodobenzoic acid by normal and sulfur dioxide exposed rats.** *J. Pharm. Sci.* 63(11): 1759-1761; 1974. (18 references)

The degree of uptake and loss of inhaled 125 I-labeled 2,3,5-triiodobenzoic acid in the lungs of Sprague-Dawley rats were investigated. The initial uptake was 0.85% followed by removal at an exponential rate. The residence half-time in the lungs was 17.7 min. Exposure of animals to 400 ppm sulfur dioxide for four consecutive days, 4 hr/day, prior to inhalation of the labeled compound did not provide statistically significant differences in the parameters studied.

75-1967. Chkanikov, D. I.; Makeyev, A. M.; Pavlova, N. N.; Grigor'eva, L. V.; Dubovoy, V. P.; Klimov, O. V. (All-Union Res. Inst. Phytopathol., USSR). **Znacheniye rezul'tatov izucheniya metabolizma 2,4-D v razlichnykh rasteniyakh dlya razrabotki metodov analiza ostatochnykh kolichestv gerbitsida. [Significance of metabolic studies on 2,4-D for the development of herbicide residue analytical methods.]** *Khim. Sel. Khoz.* 13(1): 58-63; 1975. (13 references) (Russian)

The metabolism of 2,4-D in plants was studied for the development of preparative and analytical methods for its determination. Very rapid metabolism of 2,4-D in plants was observed. However, the rates and pathways of the metabolism were different in different species. The principal metabolites in kidney beans and soybeans were 4 - *O* - beta - D - glucosides of 4 - oxy - 2,5 - dichlorophenoxyacetic acid and 4 - oxy - 2,3 - dichlorophenyacetic acid. In addition, accumulation of *N* - (2,4 - dichlorophenoxyacetyl) - L - aspartic acid and *N* - (2,4 - dichlorophenoxyacetyl) - L - glutamic acid was observed. The principal metabolites identified in cereal plants and strawberry were 1 - *O* - (2,4 - dichlorophenoxyacetyl)ω - D -glucose and a glucoside of 2,4-dichlorphenol, respectively. While the hydroxylated derivatives and the decarboxymethylated product of 2,4-D were less toxic for mice than the initial compound, the conjugates formed during hydrolysis have practically the same toxicity as the intact pesticide. Therefore, residue analysis should always cover conjugates formed with endogenous materials, which can be achieved by hydrolysis with 6 *N*-hydrochloric acid for the destruction of the conjugates. 2,4-D can then be determined gas chromatographically or photometrically method by means of 4-aminoantipyrine.

75-1968. Fraser, J.; Joiner, G. N.; Jardin, J. H. (Univ. Texas System Cancer Cent., M. D. Anderson Hosp. Tumor Inst., Houston, TX 77025). **The use of pelleted dichlorvos in the control of murine acariasis.** *Lab. Anim.* 8(3): 271-274; 1974. (7 references)

Pelleted dichlorvos was placed in the bedding of a colony of adult female outbred albino Charles River mice artificially infected with *Myobia musculi* (Schrank). The following amounts of insecticide were evaluated: 2 g (in practice about ½ teaspoon), 4 g, and 8 g. The mice were continuously exposed to the insecticide. The cages and bedding were changed on day 8, at which time fresh insecticide was added to the bedding. Mice were examined twice daily for clinical signs of organophosphate intoxication; no such signs were noted. Mice exposed for 8 days showed no live mites on the pelts, but unhatched eggs were found along the hair shafts. Mice exposed for 15 days were free of both eggs and live mites. Eight mice which had been exposed for 15 days were then housed in clean cages free of dichlorvos and on day 22 all were free of live mites and eggs and the dermatitis lesions were healed. Plasma cholinesterase values were uniformly depressed in the 3 exposed groups. By day 22 cholinesterase values returned to normal levels in groups exposed to 2 and 4 g but not in the group exposed to 8 g. Thus, dichlorvos added to the bedding is an efficacious, safe, and convenient means of eliminating *M. musculi* from a conventional mouse colony. It is recommended that the lowest dose level be used, as all 3 were equally effective in killing the mites.

75-1969. Anonymous. **Fluorocarbon aerosol propellants.** *Lancet* 1(7915): 1073-1074; 1975. (19 references)

Studies on the toxicology of fluorocarbons from aerosol products such as insecticides are summarized. Exposure of animals to concentrations of 20% dichlorodifluoromethane and dichlorotetrafluoroethane causes sluggishness, drowsiness, and tremor. Repeated or continuous exposure to dichlorodifluoromethane at high concentration showed interstitial inflammatory changes in the lung, with fatty infiltration and focal or submassive hepatic necrosis. These changes occured at concentrations of 4 μg/ml in the inhaled air, similar to the alveolar gas concentration found after use of asthma inhalers. Most studies conclude that, apart from the general anesthetic and convulsive activity seen at high concentrations, the fluorocarbons could be regarded as safe. The greatest hazard seems likely to arise when patients deliberately inhale fluorocarbons and sympathomimetic substances as they do in the treatment of asthma.

75-1970. Pocock, D. M. E.; Vost, A. (McGill Univ. Med. Clinic, Montreal Gen. Hosp., Montreal, Quebec, Canada). **DDT absorption and chylomicron transport in rat.** *Lipids* 9(6): 374-381; 1974. (23 references)

The in vivo absorption of DDT-^{14}-C in male Wistar rats and the nature of its transport in chylomicrons in intestinal lymph and in plasma were investigated. The rats were fed 100 n*M* DDT-^{14}C in oil by gastric tube. Recovery of DDT-^{14}C in thoracic duct lymph was 60% in 12 hr.

Lymph DDT-^{14}C (97%) occurred in lipoproteins of d(1.006, called chylomicrons. There was 97% DDT-^{14}C present in triglyceride core. Rats were pulse injected with chylomicrons double labeled with triglyceride-^{3}H and DDT-^{14}C. The decay of DDT-^{14}C in sequential serum samples was rapid and was independent of triglyceride-^{3}H decay. In tissues removed 14 min after injection of chylomicrons, 30% administered DDT-^{14} C was found in liver, but only 1% in adipose tissue. In hepatectomized rats, the decay of serum DDT-^{14}C was independent of and more rapid than triglyceride-^{3}H decay. With sucrose density gradients, chylomicron DDT-^{14}C transferred to higher density serum proteins in vitro and in vivo and to bovine albumin in vitro.

75-1971. Takeda, Y.; Tsukahara, I.; Takemoto, I.; Takaori, S. (Sch. Ophthalmol., Kansai Med. Coll., Moriguchi-shi, Osaka, Japan). [**Antagonistic effects of glutathione toward the effects of chlorfenvinphos, an organophosphorus insecticide, on the central visual pathway.**] *Nippon Ganka Gakkai Zasshi (J. Jpn. Ophthalmol. Soc.)* 79(4): 239-243; 1975. (25 references) (Japanese)

Antagonistic actions of pre-administered glutathione toward chlorfenvinphos injected intraperitoneally at 4 mg/kg on the central visual pathway were studied in gallamine-immobilized cats (20 animals weighing 2-4 kg). After intraperitoneal injection of 2.5-400 mg of glutathione/kg, the ERG and the induced potential in the lateral geniculate body did not show any alterations. However, the amplitude of induced potentials in the optic nerve decreased proportionally with the amount of glutathione while that of the optic area in the cerebral cortex increased. After intraperitoneal injection of 4 mg of chlorfenvinphos/kg, the ERG showed an increase, while the induced potentials in the optic nerve and geniculate body showed a decrease of amplitude which progressed with time, and the effect on induced potential of the optic area in the cerebral cortex was not consistent. Pretreatment with glutathione, antagonized the alterations of ERG and the induced potential provoked by chlorfenvinphos. The antagonism mechanism was discussed.

75-1972. Yamazaki, H.; Shimazaki, K.; Kurosawa, K.; Suzuki, A. (Jpn. Inst. Rural Med., Saku Gen. Hosp., Usuda, Nagano, Japan). [**Electron microscopic study on the subacute toxicity of organophosphorus pesticides.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(1): 1-7; 1975. (Japanese)

In subacute p.o. toxicity tests, dichlorvos was administered to male (8) and female (4) rhesus monkeys daily at 0.1, 0.3, and 1.0 mg/kg for 6 months; and to male (15) and female (15) rabbits daily at 0.2, 0.5, 1.5, and 5.0 mg/kg for 3 months. Fenitrothion was administered to the monkeys daily at 0.1, 0.5, and 2.0 mg/kg for 6 months and to rabbits daily at 1.0, 3.0, and 10.0 mg/kg for 3 months. The changes in the external ocular muscle, liver, and kidney were examined electron-microscopically at autopsy. In monkeys, changes due to dichlorvos included alteration of the junctional fold and synaptic vesicle, swelling and decrease in number of mitochondria in motor endplates of the external ocular muscle, proliferation of smooth endoplasmic reticulum, and swelling and atrophy of mitchondria and opening of rough-surfaced endoplasmic reticulum in hepatic cells. Changes due to fenitrothion included abnormal alignment of myofilaments, disappearance of Z-line, thinning of intraneural myelin sheath, decrease of synaptic vesicle, disappearance of junctional fold in motor endplates, form change and increase in number of mitochondria, and increase in both types of endoplasmic reticulum in hepatic cells. In rabbits the effects due to dichlorvos were almost the same as those in monkeys except for swelling and vacuolation in kidney tubules; the changes due to fenitrothion in external ocular muscle were almost the same as those in monkeys except there was no change in motor endplates.

75-1973. Horiguchi, Y.; Yanagisawa, T.; Ide, H.; Fujita, H.; Fujita, T.; Seki, S. (Jpn. Inst. Rural Med., Saku Gen. Hosp., Usuda, Nagano, Japan). [**Studies on the effects of organophosphorus pesticides on the central nervous system. Part 1.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural. Med.)* 24(1): 8-15; 1975. (6 references) (Japanese)

The time changes of cortical and deep EEG, ECG, blood pressure, and plasma cholinesterase activity of rabbits and rhesus monkeys were observed after acute administration of dichlorvos (p.o.) and fenitrothion (i.v.). Repeated examinations of EEG and serum cholinesterase activity in 6 workers were conducted before and after they applied organophosphorus pesticides. In animals given low dosages, the EEG showed a constant arousal type of waves without paroxysmal waves, and no great change was observed in the heartbeat or blood pressure. In animals given a larger dosage, the heartbeat and blood pressure slowly decreased before the change in the EEG which appeared after a long latency period. The threshold amount of both pesticides which caused the appearance of abnormal EEG was lower after p.o. than after i.v. injection. Administration of atropine sulfate or pralidoxime to intoxicated animals did not alter the manifestation of the abnormal EEG despite its effect in preventing depression of erythrocyte cholinesterase activity. Before application of organophosphorus pesticides 2 persons showed sporadic appearance of slow waves with moderate amplitude; after application the state intensified. In other persons no conspicuous change was seen after the application. A fairly large number of persons showed a slightly reduced serum cholinesterase activity.

75-1974. Nakao, A. (Sch. of Hyg. Fac. Med., Kyushu Univ., Fukuoka, Japan). [**Experimental studies on the mammalian toxicity of 2,4,6-trichlorophenyl-4'-nitrophenyl ether (CNP).**] *Fukuoka Igakkai Zasshi (Fukuoka Med. J.)* 66(2): 123-153; 1975. (25 references) (Japanese)

The acute p.o. toxicity of a herbicide, CNP (2,4,6-

trichlorophenyl-4′-nitrophenyl ether, 99% purity was studied using male dd-N mice and male Wistar-King rats. It was found that the LD50 p.o. to mice was about 15 g/kg, and more than 13.0 g/kg to rats. Autopsy findings included were chemical pneumonia, fatty and vacuolar degeneration and slight hemorrhage of the lung, and slight nephrosis in the kidney tubules. No injury to organs such as lung, liver, kidney, and blood was found in Wistar-King rats given the herbicide at 10 mg/animal/day for one year. After exposure of rabbits to dense dust inhalation for one hr daily for 10 to 83 days it was found that the rabbits showed irritative inflammatory symptoms in the palpebral conjunctiva and cornea and died of chemical pneumonia. However, the inhaled amount of the herbicide could not be determined. From these and previously reported results, it was considered that 2,4,6-trichlorophenyl-4′-nitrophenyl ether was lower in toxicity than conventional herbicides such as 2,4-D.

75-1975. Inokuchi, K.; Osari, R.; Sone, K.; Wakai, S.; Umezawa, K.; Iwami, T. (Sch. Pharmacol., Fac. Med., Hirosaki Univ., Hirosaki, Aomori, Japan). [**Acute toxicity test of Krecalvin. Part 2. Skin irritation test and eye-lid test using rabbits.**] *Hirosaki Igaku (Hirosaki Med. J.)* 27(1): 85-97; 1975. (6 references) (Japanese)

After applying a piece of cotton smeared with 0.5 g of 50% Krecalvin slurry (a complex compound of one mole of calcium methyl 2,2-dichlorvinyl phosphate and 2 moles of dichlorvos) to the shaved or shaved and abraded skin of the back of rabbits, the lesions were observed at 24, 48, and 72 hr. Three groups of rabbits were treated with 0.1 g of Krecalvin powder (5%) in the conjunctival sac; in the second group the eyes were washed after 2 sec., and the third group had their eyes washed after 4 sec. The primary skin irritation index was 2.75 and the compound was classified as a moderate cutaneous irritant according to Draize. The strongest eye-irritating symptoms were seen one hr after application, and the symptoms disappeared 2 days later without leaving any irreversible corneal lesion. After intravenous administration of Krecalvin at 10 mg per kg, no conspicuous change in blood pressure, respiration, or ECG was observed. After i.v. administration of only 0.5 mg/kg, the serum ChE activity showed a remarkable decrease; however, its restoration was very rapid. No conspicuous change in serum GOT and GPT was observed.

75-1976. Wegler, R. (Pflanzenschutzforschung, Farbenfabriken Bayer AG, 5600 Wuppertal-Elberfeld, Germany). **Chemie der Pflanzenschutz- und Schaedlingsbekaempfungsmittel.** [**Chemistry of pesticides, vol. 1 and 2.**] *Springer-Verlag, Berlin-Heidelberg-New York,* 1970, 671 p. (Vol. 1) and 550 p. (Vol. 2.) (6159 references) (German)

This extensive two-volume treatise contains introductory materials on the economic significance of plant protection, development of new plant-protection agents, and commercial forms of pesticides and other plant-protection agents. This is followed by sections on individual functional-categories of substances, including insecticides, chemosterilants, insect repellents, insect attractants, acaricides, nematicides and repellents for birds and mammals, and rodenticides. The second volume has sections on fungicides, herbicides, and natural plant growth regulators (phytohormones), as well as a concluding section on pesticide residues in foods and in the environment. Each of the sections is subdivided according to chemical class. Information given for each chemical subgroup includes structure, preparation method, mode of action, toxicity data, and usage information. Extensive literature references, including basic textbooks, journal articles, and patents, are provided for each category.

75-1977. Baker, R. C. (North Carolina State Univ. Raleigh, NC 27607). **Interaction between the hepatic microsomal mixed-function oxidase enzyme system and pesticides.** *Diss. Abstr. Int.* 35(10): 4792B; 1974.

Microsomal fractions were isolated from hepatic tissue, housefly abdomen, and southern armyworm midgut either by centrifugation of post-mitochondrial supernatant for 1 hr at 105,000 $\times g$ or by calcium sedimentation and low speed centrifugation. The isolation method did not appreciably affect NADPH oxidase activity, *O*-demethylation of *p*-nitroanisole, spectral parameters of cytochrome P-450, or integrity of ultrastructural constituents of hepatic microsomes. Intraperitoneal injection of mirex at a dose rate of 10 mg/kg or higher increased the hepatic microsomal cytochrome P-450 level in mice. Under the same conditions 25 mg/kg were necessary to elicit the same response in the rat. The *O*-demethylase activity was also increased. Dietary mirex also caused induction of cytochrome P-450 in the rat at all levels tested (1-250 ppm for 14 days). The cytochrome induced at higher levels differed qualitatively as well as quantitatively from that induced at lower levels. Ultrastructural examination of liver tissue after mirex feeding revealed proliferation of smooth endoplasmic reticulum. Piperonyl butoxide pretreatment of mice (500 mg/kg/day) for 3 days caused an increase in liver weight, microsomal protein, cytochrome P-450, and *p*-nitroanisole *O*-demethylation, but not of benzpyrene hydroxylation. Oxidative metabolism of piperonyl butoxide produces a metabolite which forms a complex with cytochrome P-450. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 75-7719.)

75-1978. Conaway, C. C. (Univ. Wisconsin-Madison, Madison, WI 53706). **Studies on mechanism of induction of mixed-function oxidase by *p,p′*-DDT in rat liver.** *Diss. Abstr. Int.* 35(10): 4796B; 1974.

In vitro methods suitable for studying the induction of microsomal mixed-function oxidases by *p,p′*-DDT were initially investigated. Liver slices from male rats were chosen for the experiments, since they retained cell function best. Treatment with *p,p′*-DDT at 100 mg/kg 24 hr

before sacrifice increased the amount of ^{14}C-amino acids incorporated into the microsomal fraction and slightly decreased the total in vitro incorporation of ^{3}H-5-uridine. Induction of cytochrome P-450 by *p,p'*-DDT occurred even in the presence of actinomycin D and α-amanitin, which inhibit RNA synthesis. Nuclear events inhibited by these compounds such as m-RNA synthesis were seemingly not requisites for induction of cytochrome P-450 by *p,p'*-DDT. Phosphorylation of hepatic microsomes and ribosomes by ^{32}P-ATP in an in vitro assay was not affected by in vivo treatment of rats with *p,p'*-DDT. Hepatic microsomes from rats treated with *p,p'*-DDT incorporated ^{14}C-phenylalanine in a cell-free system at a significantly higher rate than control microsomes, even after actinomycin D treatment. No effect of *p,p'*-DDT treatment on the activity of 105,000 × *g* supernatant factors necessary for cell-free amino acid incorporation was observed. It was concluded that the effects of *p,p'*-DDT on induction of microsomal mixed-function oxidase did not involve RNA synthesis, but consisted of an alteration in the rate of ribosomal protein synthesis, perhaps by changes in initiation factor activity or availability. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 75-2452.)

75-1979. Thompson, R. P. (Univ. Illinois, Urbana-Champaign, IL 61801). **A comparative study on the fate of cyanazine and atrazine in plants.** *Diss. Abstr. Int.* 35(11): 5225B; 1975.

The greater tolerance of fall panicum to atrazine than cyanazine was determined to be due to the more exensive conjugation of atrazine than cyanazine and to the fact that fall panicum is apparently able to hydroxylate atrazine but not cyanazine. Redroot pigweed also hydroxylates atrazine but not cyanazine. Cyanazine was not metabolized and atrazine was conjugated to only a very limited extent by oats and soybeans during a 24-hour exposure period. Intact sorghum plants and shoots conjugated atrazine more extensively than cyanazines, with no evidence for hydroxylation or *N*-dealkylation. Hydrolysis, *N*-dealkylation, and glutathione conjugation reactions combined to provide extensive metabolism of cyanazine and atrazine in corn. Cyanazine is thus metabolized by the general reaction for chloro-*s*-triazines. Detection of the hydroxy-acid and the deaklylated hydroxy-acid also revealed that the nitrile was hydrolyzed in corn. Absence of conjugation by sorghum plants confirmed the requirement of glutathione-*S*-transferase for chlorine in the 2-position of *s*-triazines. The *N*-dealkylation of hydroxyatrazine by sorghum is nonspecific for the presence of chlorine in the 2-position. The presence of the carboxyl group on the isopropylamino side chain of cyanazine metabolites suppresses dealkylation of the ethylamino side chain in sorghum. The metabolism data correlates well with tolerances for these compounds. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 75-11,534.)

75-1980. Butler, G. L. (Univ. Alabama, University, AL 35486). **Effects of five pesticides on twenty-one freshwater algae.** *Diss. Abstr. Int.* 35(11): 5245B; 1975.

Thirty-six freshwater algae were isolated and obtained in axenic, unialgal cultures. The isolates included 18 strains of green algae and 3 strains of the diatom genus *Nitzschia*. The isolates were subjected to various concentrations (0.001 to 25 ppm) of five pesticides (carbaryl, diazinon, methoxychlor, 2,4-D, atrazine). Atrazine was the most toxic, reducing growth of many of the isolates more than 80% at concentrations of 1 ppm or greater. Lower concentrations (1 ppm or less) of carbaryl, diazinon, methoxychlor, and 2,4-D were relatively non-toxic. Only concentrations of 10 and 25 ppm caused a 50% or greater reduction in growth. Most of the atrazine added to the cultures was recovered at the end of the two week growth period. A significant amount, as compared to controls, of 2,4-D, methoxychlor, and diazinon disappeared from several of the cultures. Loss of carbaryl was not determined because of its rapid non-biological degradation. Several isolates may be capable of growing heterotrophically using the pesticides either as a carbon or a nitrogen source. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 75-9989.)

75-1981. Reinbold, K. A. (Univ. Illinois, Urbana-Champaign, IL 61801). **Effects of the synergist piperonyl butoxide on toxicity and metabolism of pesticides in green sunfish (*Lepomis cyanellus* Rafinesque).** *Diss. Abstr. Int.* 35(11): 5254B; 1975.

The effects of piperonyl butoxide on toxicity of aldrin, methoxychlor, phorate, carbofuran, and trifluralin to green sunfish were tested under winter and summer conditions. The toxicities of methoxychlor and trifluralin were synergized by piperonyl butoxide but piperonyl butoxide antagonized the toxicity of phorate, presumably by interfering with microsomal oxidation of the insecticide to the P-O analog and to sulfoxides and sulfones. The toxicity of aldrin was not affected by piperonyl butoxide, as might be expected since dieldrin, the major metabolite, is nearly as toxic as aldrin. Carbofuran was not toxic with or without piperonyl butoxide at the level used. Under winter temperature and light conditions, methoxychlor was more toxic but trifluralin and aldrin were less toxic than under summer conditions. Residues of the pesticides in water persisted longer in winter. Studies using ^{14}C-labeled aldrin, methoxychlor, and trifluralin revealed that piperonyl butoxide inhibited epoxidation of aldrin, *O*-dealkylation of methoxychlor, and *N*-dealkylation of trifluralin. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 75-11,545.)

75-1982. Mogal, B. H. (Pennsylvania State Univ., University Park, PA 16802). **Interaction of pesticides with human serum albumin.** *Diss. Abstr. Int.* 35(11): 5467B; 1975.

The binding characteristics of three pesticides and four pesticide degradation products to human serum albumin (HSA) were studied by equilibrium dialysis at physiological pH and ionic strength. The total number of moles bound per mole of HSA were observed to be carbaryl, 2; ametryne, 3; chlorpropham, 1; 1-naphthol, 0.7; 4-chloro-*o*-toluidine, 11; 4-chloro-*N*-formyl-*o*-toluidine, 5; and *p*-nitrophenol, 8. The average association constants for different binding sites were estimated from the Scatchard plots. Binding of the first one or two moles of 4-chloro-*o*-toluidine to HSA appeared to increase its affinity for the subsequent moles of this chemical. Ten pesticides and nine degradation products of pesticides were compared to the three drug standards *in vitro* for their ability to displace bilirubin from HSA at simulated physiological conditions through the use of gel filtration technique. Statistical analysis of the data revealed that *N*-hydroxymethylcarbaryl, carbaryl, diuron, 4-chloro-*N*-formyl-*o*-toluidine, atrazine, hydroxyatrazine, methyl parathion, and sulfamethoxazole did not significantly displace bilirubin from HSA. All other compounds, *viz.*, 5-hydroxycarbaryl, chloropropham, 1-naphthol, fenazaflor, atratone, 5,6-dichloro-2-trifluoromethylbenzimidazole, 4-chloro-*o*-toluidine, amitrole, *p*-nitrophenol, ametryne, chlordimeform, and sulfisoxazole caused significant displacement. However, only sulfisoxazole, amitrole, *p*-nitrophenol, and 5-hydroxycarbaryl significantly displaced the first mole of bilirubin from the protein. Fenazaflor, carbaryl, and ametryne cause a significant decrease in the rate of excretion during the first one-half hour. The initial increase in the rate of excretion of bilirubin-^{14}C during first one-half hour was significant with DDT, but not with methyl parathion. Chlordimeform caused a drastic reduction in the excretion of bile in two of the three rats during the initial period of 3 hrs in one case and 6 hrs in the others with a concomitant decrease in the excretion of bilirubin-^{14}C. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 75-9810.)

75-1983. Yau, E. T. (Univ. Mississippi, University, MS 38677). **The effects of dichlorodiphenyltrichloroethane (DDT) on liver glycogen metabolism in the rat.** *Diss. Abstr. Int.* 35(11): 5563B; 1975.

The effects of acute administration of DDT on liver glycogen, phosphorylase, synthetase, glucose-6-phosphatase (G-6-Pase) and various metabolites (ATP, glucose, lactate and pyruvate) were investigated in male Holtzman rats. Results of a time-course study showed that hepatic glycogen level was significantly decreased at eighteen hours after a single injection of DDT (50 mg/kg, i.p.). In addition, phosphorylase and G-6-Pase activity were increased, accompanied by a decrease in synthetase activity. Dose-response studies demonstrated that the effects of DDT on the glycogen metabolizing enzymes were log-dose related, and different dosages of DDT were required to produce maximal changes for each of the enzymes. Eighteen hours after the administration of DDT (50 mg/kg, i.p.) hepatic glucose level and lactate/pyruvate ratio were significantly increased, whereas ATP concentration remained unchanged. Phosphorylase and synthetase were affected only by the *p,p'*-isomer of DDT. Nevertheless, both *p,p'*-DDT and *o,p'*-DDT were capable of stimulating G-6-Pase. Treatment of adrenalectomized rats with DDT resulted in changes similar to those observed in intact rats, suggesting that the changes induced by DDT were not mediated through either glucocorticoid or epinephrine. The rate of phosphorylase inactivation was studied in DDT-treated and control rats following decapitation, and a significantly slower rate was noted for the DDT-treated animals, indicating that phosphorylase phosphatase activity was decreased as a result of DDT administration. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 75-533.)

75-1984. Bechtel, T. J. (North Carolina State Univ., Raleigh, NC 27607). **A mathematical model of the fate of a single dose of dieldrin in an estuarine microcosm.** *Diss. Abstr. Int.* 35(11): 5714B; 1975.

Artificial ecosystems were constructed to investigate the dynamics of the pesticide dieldrin, a chlorinated hydrocarbon, in an estuarine environment under both winter and summer conditions. The systems consisted of estuarine water with associated plankton and suspended particulate material, sand, and hardshell estuarine clams, *Rangia cuneata* Gray. After dieldrin was added to the water in concentrations of 0.1, 1.0, and 10.0 ppb, it was distributed in all components of the experimental pools. Concentrations of dieldrin in the water decreased exponentially with time, while clams rapidly accumulated dieldrin and attained maximum concentrations within 8 days. The accumulation rates, as well as the total amounts of dieldrin accumulated by clams, were proportional to the initial treatment concentrations. The loss of dieldrin from clams occurring after maximum accumulation was proportional to the amount of dieldrin remaining in the clams. The sediments and plastic pool liners accumulated dieldrin rapidly after treatment and were the eventual sinks for a large percentage of the dieldrin that remained in the pools. Mass balance calculations, using the summer data, indicated that after 90 days, only 4, 6, and 3.3 percent of the dieldrin added to the 0.1 , 1.0 , and 10.0 ppb pools, respectively, could be accounted for. A mathematical model consisting of three coupled, first-order differential equations was used to calculate the rates of dieldrin uptake and decay in the experimental systems. The mean rate constants for dieldrin uptake and loss by the clams were calculated to be 224.7 and 0.683, respectively. A prediction that dieldrin would, over a long period of time, be degraded at the same rate in all system components, excluding the plastic liners, was supported by the data. The model was judged to be sufficiently general that it could be applied, before more complicated models are employed, to concentrations of dieldrin outside the range of those used in this study as well as to other aquatic organisms and to

different pollutants. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 74-10,390.)

75-1985. Gage, J. C. (Univ. Lund, Dep. Environ. Health, Lund, Sweden). **Mechanisms for the biodegradation of organic mercury compounds: the actions of ascorbate and of soluble proteins.** *Toxicol. Appl. Pharmacol.* 32(2): 225-238; 1975. (12 references)

Organic mercury compounds are to varying extents degraded by ascorbate and by soluble proteins. Phenyl-, methyl-, and methoxyethylmercury are attacked by ascorbate, provided that the solution has been exposed to air in the presence of Cu^{2+}, although the reaction can subsequently proceed in the absence of air. Mercury vapor (Hg) and inorganic mercury (Hg^{2+}) are released, and the Hg^0/Hg^{2+} ratio varies with the three compounds, being high with methoxyethylmercury and very low with methylmercury. The Hg^0/Hg^{2+} ratio is much reduced in the presence of cysteine. It is suggested that the ascorbate free radical is responsible for the reaction. γ-Globulin can degrade phenylmercury, but not methyl- and methoxyethylmercury, to yield Hg^{2+}. The action is much stimulated by glutathione and dithiothreitol, and the evidence suggests that these act by reducing protein disulfide groups, and that the Hg^{2+} released remains attached to reactive protein thiol groups. Serum albumin appears to have a similar action. Most of the activity of the soluble fraction of a rat liver homogenate can be accounted for by the presence of thio-activated proteins. (Author abstract by permission)

75-1986. Baldwin, R. C.; Pasi, A.; MacGregor, J. T.; Hine, C. H. (Toxicol. Activity, Dep. Pharmacol., Univ. California, San Francisco, CA 94143). **The rate of radical formation from the dipyridylium herbicides paraquat, diquat, and morfamquat in homogenates of rat lung, kidney, and liver: an inhibitory effect of carbon monoxide.** *Toxicol. Appl. Pharmacol.* 32(2): 298-304; 1975. (29 references)

In an attempt to elucidate the mechanism of toxicity in mammals and to explain some organ specificities observed in chronic dipyridylium herbicide intoxication, the specific rates of radical cation appearance for paraquat, diquat, and morfamquat were measured in homogenates of rat lung, kidney, and liver. In each organ homogenate, the order of the rates was morfamquat > diquat > paraquat. For each herbicide the order of the rates was liver > lung > kidney. The results are inconsistent with the hypothesis that selectively enhanced rates of radical production in the target organs are responsible for the specificities observed. Carbon monoxide inhibited the rate of appearance of the diquat radical in all three organ homogenates; in contrast, the rates of radical formation from paraquat and morfamquat were not affected. No inhibition was observed in any combination of organ and herbicide by either potassium cyanide or SKF 525-A. It is concluded that diquat is reduced by a different electron transferring agent than either paraquat or morfamquat. (Author abstract by permission)

75-1987. Sherman, H.; Culik, R.; Jackson, R. A. (Cent. Res. Dep., Haskell Lab. Toxicol. Ind. Med., Wilmington, DE). **Reproduction, teratogenic, and mutagenic studies with benomyl.** *Toxicol. Appl. Pharmacol.* 32(2): 305-315; 1975. (9 references)

In a three-generation rat reproduction study with benomyl fungicide, no reproduction or lactation differences were observed among control and test groups of animals at the highest dietary level of 0.25% benomyl. No pathologic changes were found in tissues from weanling pups of the F3B litter. In a teratogenic study, feeding of as much as 0.50% benomyl (highest dietary level tested) to pregnant rats from days 6 through 15 of the gestation period did not affect the outcome of pregnancy or embryonal development. In a dominant lethal study study in rats, benomyl at the highest dietary level tested (0.25%) induced no dominant lethal mutation. A separation study showed that substantial amounts of a metabolite, methyl 2-benzimidazolecarbamate (BCM), were present in the blood of a rat 1 hr after oral dosing with [2-^{14}C]benomyl. (Author abstract by permission)

75-1988. Norback, D. H.; Engblom, J. F.; Allen, J. R. (Dep. Pathol. Univ. Wisconsin Med. School, Madison, WI 53706). **Tissue distribution and excretion of octachlorodibenzo-*p*-dioxin in the rat.** *Toxicol. Appl. Pharmacol.* 32(2): 330-338; 1975. (26 references)

The contamination of several commercial compounds by chorinated dibenzo-*p*-dioxins and the health hazards relative absence of toxicity following high dosages of octachlorodibenzo-*p*-dioxin (OCDD) in rats was confirmed. A moderate proliferation of the hepatic endoplasmic reticulum (ER) and hepatomegaly occurred. Daily administration of a radioactive analog of OCDD to rats by gastric intubation for 21 days resulted in the recovery of over 90% of the total dose in the feces as unabsorbed materials. A small lipid-soulble fraction was excreted in the urine. After 21 days of administration, less than 1% of the total dose was present in the rat tissues. The liver contained the highest concentration with approximately 50% of the body load found within this organ. The radioactivity in the adipose tissue was approximately 25% that in the liver. Significant levels of radioactivity were found in the kidneys, heart, testes, skeletal muscle, skin, and serum. The greatest reservoirs of the material were liver, skin, and adipose tissue. Over 95% of the radioactivity within the liver was associated with the microsomes and was equally distributed within the rough and smooth fractions. Distriubtion of the detectable radioactivity within rats that subsequently received a control diet for 6 wk was confined to the liver, adipose tissue, and skin at levels approximately 20-25% that found immediately after the 21-day period of administration. The route of excretion was through the urinary system and the rate corresponded

to a biological half-life of approximately 3 wk. Toxicity, hepatic alterations, percentage of absorption, body distribution, and biological half-life of OCDD are compared to those parameters of the extremely toxic tetrachlordibenzo-*p*-dioxin (TCDD). Microsomal localization of the compounds is postulated to result in sequestration of the material. (Author abstract by permission)

75-1989. Harbison, R. D. (Cent. Toxicol., Vanderbilt Med. Cent., Nashville, TN 37232). **Comparative toxicity of some selected pesticides in neonatal and adult rats.** *Toxicol. Appl. Pharmacol.* 32(2): 443-446; 1975. (15 references)

Toxicity of two groups of pesticides was studied in adult and newborn rats. The chlorinated groups of pesticides, heptachlor, chlordane, and DDT are less toxic in the newborn when compared to the adult, but phenobarbital pretreatment potentiates their toxicity in the newborn. The organophosphorus insecticide, parathion, is more toxic in the newborn when compared to adult, but phenobarbital pretreatment antagonized the toxicity of this cholinesterase inhibitor. Chlorinated pesticides are generally less toxic in the newborn, while pesticides of the cholinesterase inhibitor group are more toxic. (Author abstract by permission)

75-1990. Sen, S. (Chromosome Res. Cent., Dep. Botany, Univ. Calcutta, Calcutta, India). **Effect of 2,4-D on nucleic-acid and histone-precursor incorporation into nuclei.** *Naturwissenschaften* 62(4): 184-185; 1975. (13 references)

Rooted bulbs of *Allium cepa* were immersed in solutions containing 0.01% 2,4-D and equal volumes of tritiated thymidine, 2 μc, or uridine, 5 μc for 24 hr. Similar experiments were carried out on mature endosperm cells of *A. tuberosum* and meristerms of *Vicia faba*. Both root and endosperm cells fed with 2,4-D and ^{3}H-thymjdine showed heavy labeling both in diploid and polytenic nuclei compared to the tissue fed with only ^{3}H-thymidine. In all cases with 2,4-D, polytenic nuclei showed heavier incorporation than without 2,4-D as well as than the diploids. Heavier precipitation in polytenic nuclei as compared to diploids may indicate that 2,4-D also induced replication of chromosome thread, possibly accelerating the activity of DNA polymerases. Incorporation of ^{3}H-uridine was very heavy in the nucleoli of mature root cells as well as in endosperm in control sets. With 2,4-D and ^{3}H-uridine, labeling was less in most of the nucleoli, suggesting that 2,4-D may have a retarding effect on the normal process of transcription in differentiated nuclei, through possible action of RNA polymerase. After arginine incorporation, uptake is heavy in the cycloplasm and in the nucleus in treated cells as compared to controls. Such heavy arginine incorporation may be an index of acceleration of histone synthesis and repression of the activity of certain genes with retardation of differentiation. These findings suggest that, though transcription in general is retarded with 2,4-D, histone mRNA may be transcribed, or alternatively heavy histone synthesis may be due to repeated translation of histone messenger. The property of 2,4-D as described here of inducing chromosome replication, retarding transcription, and acclerating histone synthesis has far-reaching implications in the study of differentiation.

75-1991. Lay, J. P.; Weisgerber, I.; Klein, W. (Inst. Oekol. Chem. Gesellschaft Strahlen- und Umweltforsch. mbH, Munich, Germany). **Conversion of the aldrin/dieldrin metabolite dihydrochlordene dicarboxylic acid-^{14}C in rats.** *Pestic. Biochem. Physiol.* 5(3): 226-232; 1975. (12 references)

The metabolism of dihydrochlordene dicarboxylic acid in warm-blooded organisms is studied by in vivo experiments. Albino rats received a single i.v. dose of dihydrochlordene dicarboxylic acid-^{14}C (4.03 μg/g for males and 4.09 μg/g for females). During the investigation none of the animals showed any disability as a consequence of dihydrochlordene dicarboxylic acid injection. The dihydrochlordene dicarboxylic acid was excreted rather quickly from the warm-blooded organism. The organs of the body contained less than 0.1 ppm of radioactive substances with the exception of the injection site as well as muscle fat, ventral fat, and blood. Of the excreted radioactivity, 44% consisted of metabolites. Nine metabolites were isolated from feces and urine extracts. Three metabolites were identified: two isomers of dechlorodihydrochlordene-dicarboxylic acid (total 22.5%) and dihydroxychlordene-dicarboxylic acid-dimethyl ester(11.3%). From these experiments it was determined that dihydrochlordene dicarboxylic acid is not the end product of aldrin/dieldrin metabolism. It was metabolized to a large degree within one week of the experiment. It is obvious that the dechlorination took place in the liver as shown in in vitro experiments with rat-liver homogenates

75-1992. Quistad, G. B.; Staiger, L. E.; Schooley, D. A. (Zoecon Corp. Res. Lab., Palo Alto, CA 94304). **Environmental degradation of the insect growth regulator methoprene. V. Metabolism by houseflies and mosquitoes.** *Pestic. Biochem. Physiol.* 5(3): 233-241; 1975. (20 references)

Tlhe metabolism of methoprene by principal target insects, mosquito and housefly larvae, is reported as part of a comprehensive study of the environmental degradation of methoprene. The most abundant primary metabolite in third- and fourth-instar *Aedes* and fourth-instar *Culex* larvae was the hydroxy ester while the hydroxy acid predominated in third-instar *Musca* larvae. Biological isomerization of the double bond at C-2 methoprene was an effective mode in insect detoxication, but these dipterans apparently cannot isomerize the (2Z) isomer of methoprene to methoprene. In general, piperonyl butoxide and triorthocresyl phosphate slightly increased the morphogenetic activity of methoprene in these insects.

75-1993. Doherty, J. D.; Matsumura, F. (Dep. Entomol., Univ. Wisconsin, Madison, WI). **DDT effects on certain**

ATP related systems in the peripheral nervous system of the lobster *Homarus americanus*. *Pestic. Biochem. Physiol.* 5(3): 243-252; 1975. (24 references)

The effects of DDT on various ATP utilizing enzymes in the lobster peripheral nerve were studied. On the basis of inhibition by ouabain and DDT, 4 classes of ATPase enzymes were recognized: (1) ATPase activity sensitive to both ouabain and DDT inhibition, Type A; (2) ATPase activity sensitive to DDT only, Type B; (3) ATPase activity sensitive to ouabain only; and (4) ATPase activity not sensitive to either. Type A ATPase is considered part of the total (Na^+ —K^+) ATPase enzyme associated with the electrogenic pump. Type B ATPase consisted of an uncharacterized Na^+, K^+, and Mg^{2+} stimulated ATPase and includes also a small portion of Mg^{2+} stimulated ATPase. Ca^{2+} stimulated ATPase activity was also detected but was not significantly affected by DDT. Proteins with actomyosin-like properties were also noted, though this superprecipitation process was only slightly affected by DDT. Other systems studied included the transfer of (γ-P)ATP to endogenous proteins and added histone in the presence and absence of c-AMP. DDT generally stimulated ^{32}P incorporation, while it inhibited a portion of the specific c-AMP dependent protein kinase activity. From these studies it was concluded that DDT can inhibit or otherwise interfere with a variety of enzymatic reactions which utilize ATP as a substrate. Of these systems, the Type B ATPase bore overall resemblance to the possible target for DDT.

75-1994. Ueda, K.; Gaughan, L. C.; Casida, J. E. (Div. Entomol. Parasitol., Univ. California, Berkeley, CA 94720). **Metabolism of four resmethrin isomers by liver microsomes.** *Pestic. Biochem. Physiol.* 5(3): 280-294; 1975. (11 references)

Microsomal esterases of mouse and rat liver readily cleave the *trans*- but not the *cis*-isomers of resmethrin. The ester linkage also appears to undergo oxidative cleavage when esterase attack is minimal, that is, with (+)-*cis* and particularly (-)-*cis*-resmethrin in microsome-NADPH systems and with any of the isomers when NADPH is added to microsomes pretreated with TEPP. Metabolites retaining the ester linkage are detected in significant amounts only with (+)-*cis*-resmethrin in which case they are formed by oxidation at either the *trans*(E)- or *cis*(Z)-methyl group of the isobutenyl moiety with or without oxidation of the benzylfurylmethyl group. Metabolites of each acid moiety include chrysanthemic acid and up to 6 derivatives of this acid formed by oxidation at the *trans*(E)- or *cis*(Z)-methyl group yielding the corresponding alcohol, aldehyde, or acid, with chrysanthemate isomer and enzyme source variations in the preferred site of oxidation. The major identified metabolite of the alcohol moiety is either benzylfurylmethanol or the corresponding carboxylic acid depending on the enzyme system used. In the course of microsomal oxidation, a fragment from the alcohol but not the acid moiety of (+)-*trans*- and (+)-*cis*-resmethrin is strongly bound to microsomal components. These findings confirm in vivo studies on the isomeric variations in metabolism of the resmethrin components.

75-1995. Bus, J. S.; Aust, S. D.; Gibson, J. E. (Dep. Pharmacol., Michigan State Univ., East Lansing, MI 48824). **Lipid peroxidation: a possible mechanism for paraquat toxicity.** *Res. Commun. Chem. Pathol. Pharmacol.* 11(1): 31-38; 1975. (21 references)

The 7-day i.p. LD50 of paraquat was determined in adult female Swiss-Webster mice maintained on normal diets, diets supplemented with diethyl maleate, or diets deficient in selenium or vitamin E. In some cases, the selenium and vitamin E deficient diets were supplemented with selenium (0.1 or 2.0 ppm) or vitamin E (45 or 1500 mg/kg), respectively. The toxicity of paraquat in these mice was significantly enhanced by maintenance on diets deficient in selenium or vitamin E and by pretreatment with diethyl maleate. These diets did not alter the weight gain or overall physical condition of the treated mice compared to the controls. Liver GSH peroxidase activity was only 16% normal in the animals fed the selenium deficient diet, indicating selenium deficiency. Diethyl maleate also reduced the liver GSH to 35.2% of control values. Supplementation of the selenium and vitamin E deficient diets with selenium or vitamin E brought the paraquat LD50 to control levels, but high levels of selenium or vitamin E in the diet did not protect against paraquat toxicity. The data indicates that paraquat toxicity may be mediated via lipid peroxidation.

75-1996. Vargova, M.; Kovalcik, V. (Natl. Inst. Hyg., Bratislava, Czechoslovakia). **Vplyv heptachloru na toxicitu amidopyrinu. [Effect of heptachlor on aminopyrine toxicity.]** *Bratislav. Lek. Listy* 63(1): 87-92; 1975. (20 references) (Serbo-Croatian)

The effect on acute toxicity of aminopyrine of single and repeated administration of heptachlor, estimated by LD50 and mean lethal time (LT50), is reported. A single heptachlor administration reduces acute aminopyrine toxicity after 72 hr and a statistically significant reduction was observed after 96 hr. The groups receiving simultaneous low dosages of heptachlor showed 50% mortality after 6.9 days compared to 4 days in the control group. The low slope of the straight lines prevented evaluation of relative toxicity.

75-1997. Meiniel, R. (Lab. Biol. Anim., Univ. Clermont, Aubiere, France). **Modalites de mise en place et evolution des malformations squelettiques axiales chez l'embryon d'oiseau soumis a un insecticide organophosphore: le parathion. [Modalities of development and evolution of axial skeletal distortions in parathion treated bird embryos.]** *Bull. Soc. Zool. Fr.* 99(2): 237-244; 1974. (21 references) (French)

Administration of parathion before incubation or at the beginning of development induces axial malformations

in chicks (4th day of incubation) and quail (6th day of incubation) primarily in the cervical region. Histological abnormalities appear before morphological distortions in these species. When parathion is injected at late stages (10 days for the chick; 11 days for the quail), cervical malformations can develop. Following this treatment, neural arches can sometimes join though vertebral fusions are observed less often. Carotid, trachea, and hyobranchial cornu are also distorted by treatments at late stages.

75-1998. Alnot, M. O.; Lefevre, H.; Pfister, A.; Da Lage, C. (Lab. Histol. Embryol., Fac. Med., Necker-Enfants Malades, Paris, France). **Observations preliminaires sur la toxicite et le pouvoir teratogene du captane chez la ratte Wistar. [Preliminary observations on the toxicity and teratogenic action of captan in Wistar rats.]** *C. R. Soc. Biol.* 168(10-12): 1173-1177; 1974. (10 references) (French)

The toxicity of captan is greater during gestation than in nonpregnant female rats. Treated animals reveal an inflammatory reaction of serous membranes (particularly the peritoneum) and visceral lesions of the lung, liver, and kidney. Results of embryotoxic and teratogenic action are resorption nodules and, in surviving fetuses, ocular lesions (vesiculization of lens fibers).

75-1999. Knackmuss, H. J. (Inst. Mikrobiol., Univ. Goettingen, Goettingen, Germany). **Ueber den Mechanismus der biologischen Persistenz von halogenierten aromatischen Kohlenwasserstoffen. [The mechanism of biological persistence of halogenated aromatic hydrocarbons.]** *Chem. Z.* 99(5): 213-219; 1975. (21 references) (German)

Chloro-substituted aromatic compounds are degraded by microorganisms mainly by cometabolism because of the inertness of halogen substituents against nucleophilic replacement. Model compounds investigated show that the electrophilic attack of the oxygenases, particularly the pyrocatechases, is impeded by the negative induction influence (I-effect) of halogen substituents. In opposition to the steric effect of halogen substituents, the I-effect must be a general principle of chlorarene persistence. The effect of the halogen can weaken the I-effect in certain positions of substitution. Halogen substituents can be replaced more easily and total mineralization is possible after loss of aromaticity by the action of dioxygenases. Because a number of new catabolic activities must be gained simultaneously for the utilization of higher chlorinated aromatic hydrocarbons, little chance exists for the evolution of bacteria with greater capabilities for the degradation of these xenobiotics.

75-2000. Dinu, L.; Ichim, A.; Radovici, E.; Cristea, E.; Boghianu, L.; Ciupe, R.; Mihailescu, I. (Inst. Hygiene Pub. Health, Bucharest, Romania). **Effect of DDT administration on some enzymatic reactions in rat tissue.** *Rev. Roum. Biochim.* 11(4): 247-255; 1974. (17 references)

Investigations were made of the interrelations between the insecticidal substances technical (isomer mixture) DDT and pure *p,p'*-DDT isomer and the activity of some enzymes involved in metabolizing foreign compounds and in intermediary metabolism in white rats. For 72 days, 46 Wistar rats were given repeated subacute doses of 20 ppm DDT in the diet. Results indicated that in white rats, growth was not affected by the insecticide substances administered. Pure DDT and *p,p'*-DDT isomer showed increased aldolase, glutamate-oxalacetate transaminase, and glutathione reductase activity in the liver, ATP-ase activity in the brain and LDH in the serum, and a decrease of the alkaline phosphatase activity in the serum. The *p,p'*-DDT isomer has stimulated glutathione reductase and aryl sulphatase. Accumulation of pure and technical DDT in the adipose tissue was higher than that of the *p,p'*-DDT isomer. The toxic effects of the insecticides tested appear to be a complex of interrelations between the enzymatic activity and the functional modifications. These effects, hidden in the analysis of the health state studied on the basis of global toxicological indicators, have a high degree of specificity thus constituting a sure support for the knowledge and appreciation of subclinical states of intoxication.

75-2001. Spynu, E.; I.; Kuczak, J. A. (Inst. Hyg. and Toxicol. Pesticides, Polymers and Plastics, Kiev, USSR). **Zasady kompleksowego normowania pestycydow w srodowisku czlowieka. [Principles of comprehensive regulation of pesticides in human environment.]** *Rocz. Panstw. Zakl. Hig.* 25(3): 325-327; 1974. (Polish)

The principles of comprehensive regulation of pesticides are discussed. The sequence of investigation according to these principles is: 1) experimental toxicological studies in animals, 2) determination of admissible dose for man based on comparative sensitivity of man and animals, 3) determination of pesticides in different elements of the environment, and 4) comparison of admissible dose with amount penetrating into the human organism with food, water, and air. The need for compreshensive standardization of pesticides for accurate and scientific justification of the recommended admissible dose is stressed. Rapid determination of standards for contamination of atmospheric air can be calculated using mathematical formulas arrived at from analysis of correlation and regression using standards for contamination at workplaces, physical chemical properties of the substance, and toxicological characteristics. Using this method the following equation between the maximal admissible concentration of the substance in the air at the workplace and the maximal admissible concentration in atmospheric air over a 24 hour period has been arrived at: $\log y = (-2.6 \pm 0.28) (0.88 \pm 0.16) \log x$. Comparison of values of admissible concentrations in atmospheric air arrived at by means of scientific investigation with values arrived at by appropriate calculations gave satisfactory results. Standards

(norms) arrived at by way of calculation should be considered as temporary norms and should be used for orientation purposes. They do not eliminate the need for experimental studies for possible correlations.

75-2002. Wojcik, J.; Suwala, Z.; Beskid, M. (Dep. Commun. Hyg., Nat. Dep. Hyg., Warsaw, Poland). **Wplyw przewleklego stosowania malych ilosci tritoxu-30 w wdzie do picia na watrobe szczura. [Effect of long-term administration of low doses of tritox-30 in drinking water on rat liver.]** *Rocz. Panstw. Zakl. Hig.*25(6): 616-626; 1974. (12 references) (Polish)

The effects on rat livers of tritox-30 (a mixture of DDT, lindane, and methoxychlor) administered in drinking water in amounts of 15, 1.5, and 0.15 mg/cm³ for 9 mo were investigated. Histochemical investigations were performed, staining glycogen by the PAS method, ribonucleic acids with toluidine blue by the method of Crachet, and fats with oil red O. The activity of acid and alkaline phosphatase and non-specific esterases was determined by the coupling method. In all poisoned rats morphotic changes were revealed in the hepatocytes. They appeared as damage to the nucleus and cytoplasm of the cells and appearance of fat globules in the cytoplasm. In the hepatocytes the glycogen and ribonucleic acid content was reduced, the activity of respiratory enzymes was decreased (succinic dehydrogenase and cytochrome oxidase). The intensity of changes in the hepatocytes in various rat groups was proportional to the dose of the preparation.

75-2003. Weeks, R. E.; Hendrick, H. G. (Coll. Life Sci., Louisiana Tech Univ., Ruston, LA 71279). **Influence of a systemic fungicide on oxygen uptake by soil microorganisms.** *Soil. Sci.* 119(4): 280-284; 1975. (9 references)

Oxygen uptake was determined by manometric methods on the microorganisms in a greenhouse potting soil, a bacterial isolate from this soil, and a bacterial isolate from a peach orchard soil, using as carbon sources the systemic fungicide Benlate (Fungicide 1991, 50% wettable powder active ingredient) and its active component benomyl (reagent grade methyl 1-(butylcarbamoyl)-2-benzimidazole-carbamate). Uptake by the microorganisms in the greenhouse potting soil was higher in systems containing Benlate than in those without the fungicide. A bacterial isolate (*Achromobacter* sp.) from the greenhouse potting soil showed higher trends in oxygen uptake with autoclaved soil plus Benlate than in soil with benomyl added at the same concentration. Oxygen uptake by a bacterial isolate from a peach orchard soil (*Achromobacter* sp.) was significantly higher in a system with benomyl, inorganic salts, and glucose than in the same system with Benlate, suggesting an additive effect by benomyl. Results with the bacterial isolate from the peach orchard soil where the fungicide and benomyl were added at the 16 hr time indicated that Benlate and benomyl were inhibitory to oxygen uptake once respiration had begun.

75-2004. Ghizelea, G.; Czeranschi, L. (Inst. Public Hyg. Sanit., Bucharest, Romania). **Influenta pesticidelor carbamice zineb si tiuram asupra ciclului estral si a capacitatii de reproducere a sobolanului alb. [Influence of the carbamate pesticides zineb and thiram on the estrous cycle and reproductive capacity of white rats.]** *Stud. Cercet. Endocrinol.* 24(6): 491-501; 1973. (6 references) (Romanian)

Experiments on the acute, subacute, and chronic toxicity of zineb and thiram are reported. Mortality rates, growth tests, estrous cycle dynamics, gonadotrophic functions of the pituitary gland, and reproductive tests are used as toxicity indicators. Results obtained show that the test substances affect uterine weight (in acute and subacute tests) and ovary weight in acute tests. A reduction of the active phase and the prolongation of the resting period is observed. Effects on the estrous cycle are of a cyclic nature with initial prolongation of the menstrual period followed by its reduction until it returns to a normal state after 107 days. Carbamates greatly influence the gonadotrophic function of the pituitary gland. In reproduction tests, it was shown that pups have a significant weight reduction about the 20th day of gestation in those groups given higher doses of carbamates.

75-2005. Kennedy, G. L., Jr.; Fancher, O. E.; Calandra, J. C. (Ind. Bio-Test Labs., Inc., Northbrook, IL 60062). **Nonteratogenicity of captan in beagles.** *Teratology* 11(2): 223-226; 1975. (4 references)

Pregnant beagle bitches were maintained throughout the gestation period on diets containing 0, 30, or 60 mg/kg of captan. After whelping, half of the bitches were put on a stock diet containing no captan and the remainder were maintained on the captan-containing diets throughout lactation. The bitches were killed after weaning and the pups were killed at 8 weeks of age. None of the bitches showed signs of toxicity, and all gained weight normally and delivered normal numbers of live pups. All pups from the captan-treated bitches appeared normal both grossly and histologically, and X-ray evaluation of skeletal development revealed no structural defects. Neither survival nor growth of the pups was affected by pre- or post-natal captan treatment of the bitches. Thus, captan is not adversely affected by exposure to the chemical.

75-2006. Anonymous. **Organische fosforverbindingen. [Organic phosphorus compounds.]** *Tijdschr. Diergeneesk.* 98(15): 723-730; 1973. (Dutch)

Physical, chemical, and toxicological properties, physiological effects, and degradation of such anthelmintics as haloxon, coumaphos, trichlorfon, dichlorvos, and phthalophos are described. These pesticides are partly hydrolyzed and metabolized in the gastrointestinal tract of ruminants, and partial resorption takes place. The acute toxicity depends, among other things, on the particle size in the case of coumaphos and on the concentration in the case of trichlorfon. Phosphothionates are metabolized to

phosphates by living organisms. The metabolites may be more toxic than the original compounds, as in the case of parathion which forms paraoxon, and coumaphos which metabolizes to coroxon. Trichlorfon is metabolized to the equally toxic dichlorvos. Phosphates, carboxy esterases, and amidases inactivate organophosphorus compounds in the organism. Organophosphorus pesticides are eliminated rather rapidly from the system, but cause cholinesterase inhibition, parasympathetic excitation, muscular fasciculation, pareses, and depression of the respiratory center. Atropine and oximes are the best antidotes of organophosphorus pesticides.

75-2007. Lemma, A.; Ames, B. N. (Inst. Pathobiol., Haile Sellassie I Univ., Addis Ababa, Ethiopia). **Screening for mutagenic activity of some molluscicides.** *Trans. R. Soc. Trop. Med. Hyg.* 69(1): 167-168; 1975. (4 references)

Possible mutagenic activities of various molluscicides were tested in a bacterial system. The histidine-requiring mutant of *Salmonella typhimurium* LT-2 (his G46) was used to test for mutagens causing base-pair substitution, and the histidine-requiring frame-shift mutant of *S. typhimurium* LT-2 (hisC207) was used to test for mutagens causing addition or deletion of one or two base-pairs. One mg of the test molluscicide was placed in the center of a petri dish which had been heavily seeded with either mutant; only organisms which did not require histidine (i.e., mutants) would grow in the histidine-deficient medium used. In this system, none of the following molluscicides was mutagenic: Endod, Bayluscide (clonitralide), Frescon (trifenmorph), copper sulfate, and sodium pentachlorophenate.

75-2008. Allegrini, J.; Simeon de Bouchberg, M.; Julien, J. L. (Lab. Microbiol. Zool., Fac. Pharm., Montpellier, France). **Importance de la formulation sur l'activite du fenitrothion vis-a-vis de la microflore tellurique.** [**Significance of the formulation for the activity of fenitrothion on the soil microflora.**] *Trav. Soc. Pharm. Montpellier* 34(4): 351-358; 1974. (3 references) (French)

The influence of the formulation and mode of application of fenitrothion on its activity on the soil microflora was studied in laboratory tests, using fenitrothion in pure form, dissolved in ethanol or water, as the emulsifiable concentrate, or as granular material with 3% active ingredient content. Proliferation of bacteria, flagellates, and ciliates was observed 3 and 7 days after the application of the different formulations. This accompanied a considerable increase in the total bacterial count, especially in aquaria treated with fenitrothion dissolved in ethanol and emulsifiable fenitrothion diluted with ethanol. The increase in the ammonifying bacteria count was commensurate with that of the total microbe count. The most spectacular increase was shown by the sulfate-reducing bacteria count in all aquaria except that treated with granulated fenitrothion. The proliferation of the microorganisms was primarily due to the solvent used in the formulation.

75-2009. Jaramillo, R.; Blasco, M. (Dep. Invest. Agric., Tica Frutera S. A., San Jose, Costa Rica). **Accion del nematicida 1,2-dibromo-3-cloropropano sobre el metabolismo del suelo.** [**Effect on the soil metabolism of the nematicide 1,2-dibromo-3-chloropropropane.**] *Turrialba* 23(4): 480-482; 1973. (4 references) (Spanish)

The nematicide 1,2-dibromo-3-chloropropane (DBCP) was tested at 4.7, 9.4, 18.8, and 28.2 ppm to determine its effect on soil metabolism measured in terms of CO_2 production. The soil samples were dried and sifted through a 2 mm mesh screen; 10 g fractions were incubated for periods of 1, 2, and 3 weeks. The incubation technique used is based on the work of Cornfield. The doses of DBCP were then applied to the samples. After a week of incubation the soil metabolism is in inverse proportion to the concentration of DBCP. The second week's results were similar. After three weeks, all doses of DBCP except 28.2 ppm enhanced soil metabolism. It was evident that the application of the nematicide brought about a depression of soil activity which detrimentally influenced biochemical reactions. On the other hand, the generation of CO_2 during incubation shows that the sample was degraded by microorganisms. Replacement of the halogens in the DBCP molecule by hydroxyl groups yields glycerol, which is readily used as an energy source by microorganisms.

75-2010. Kosutzky, J.; Adamec, O.; Ferencik, M.; Ledec, M.; Bobakova, E. (Immunol. Res. Lab., Dep. Med. Microbiol. Immunol., Fac. Med., Comenius Univ., Bratislava, Czechoslovakia). **Vplyv DDT na tvorbu protilatok voci korpuskularnemu antigenu u hydiny.** [**The effect of DDT on the formation of antibodies against the corpuscular antigen in poultry.**] *Vet. Med. (Prague)* 19(6): 373-379; 1974. (15 references) (Czech)

The effect of technical DDT (applied in feed at the rate of 10 and 100 mg/kg) on the immune response of poultry to the corpuscular antigen was investigated. The hens of the hybrid Ross breed (40 birds) were immunized with a 15% suspension of ram erythrocytes after 11 mo of DDT application. The effect of short-term administration of the same doses of DDT (for 14 days) was studied in 40 Peking ducks. The changes in the antibody response of the birds to which DDT had been applied did not reach the level of statistical significance in comparison with the control birds. A 2-stage effect of the insecticide was observed in both experiments. At the initial stage of the formation of antibodies, higher average titers were obtained in the groups to which DDT was applied in feed. At the stage of the decrease of the antibody titer, a reverse tendency was observed; the average titer of the test groups was lower. A similar character of changes was found in the ducks in the case of the secondary response to the antigen. No significant changes in the levels of immunoglobulins G and M were observed in the chickens after four weeks of DDT administration at 200 mg/kg in feed.

75-2011. Didenko, G. G.; Gupalovich, T. D. (All-Union Res. Inst. Hyg. Toxicol. Pesticides, Polymers and Plas-

tics, Kiev, USSR). **Aktivnost' dezoksiribonukleazy i geksokinazy v syvorotke krovi myshey pri deyistviy uretana i nekotorykh pestitsidov. [The activity of deoxyribonuclease and hexokinase in blood serum of mice exposed to urethane, and certain pesticides.]** *Vop. Onkol.* 21(1): 57-60; 1975. (17 references) (Russian)

The effects of a highly active blastomogen (urethane) and pesticides producing minimal blastomogenic action (ziram, zineb) or none at all (lindane) on changes in DNase activity and the hexokinase test in mouse blood were studied. Urethane, ziram, and zineb caused the appearance of hexokinase activity in blood serum and enhanced activity of DNase in the pretumor period. These changes were lacking during exposure to γ-BHC (lindane), and no blastomogenic effect was shown.

75-2012. Shtenberg, A. I.; Bogomolova, Z. N.; Gavrilenko, E. V.; Gadzhieva, Z. M.; Orlava, N. V.; Torchinsky, A. M.; Khovaeva, L. A. (Inst. Food Res. Akad. Med. Scim SSSR, Moscow, USSR). **O pereras-predelenii i toksicheskom deistvii deponirovannogo v organizme DDT. [On the redistribution and toxic action of the DDT depot in the mammalian body.]** (16 references) (Russian)

The redistribution and toxic action of DDT stored in adipose tissue were investigated in tests on male Wistar rats. A DDT depot was built up by introducing a 0.2 mg/kg dose of DDT over a six-month period, followed by a 20-day fast which brought about release of DDT from the depot. Tests on the toxic effect of DDT with a simultaneous low protein diet were also conducted. After DDT buildup, followed by a month's ration containing 5% protein, these animals were subjected to a 20-day fast. DDT residues in organs and tissues (omentum, liver, brain) of test rats did not exceed 10% of the quantity introduced at the time that the depot was built up. During fasting, a noticeable movement of DDT from the depot occurred. This was the same in test and control groups. DDT from the depot entered the liver and brain only in test animals and provoked changes in the activity of several enzymes in these organs. The low protein diet somewhat intensified these changes.

75-2013. Zamfir, G.; Apostol, S. (Inst. Med. Pharm., Iasi, Romania). **Zur Problematik der Wirkung einiger Pestizide auf die hygienisch-sanitaeren Indikatoren des Wassers. [Problems concerning the effect of some pesticides on the hygienic and sanitary indicators of water.]** *Z. Gesamte Hyg. Ihre Grenzgeb.* 20(11): 777-781; 1974. (15 references) (German)

A complex sanitary-hygienic assessment is presented of detox (DDT), lindane, DNOC, dibutox, dipterex, tetradifon, and ethanolamine in water. Toxaphene, endrin, and other pesticides impair the organoleptic properties of water and cause discoloration and turbidity even when they are present in trace quantities. Similar effects are also attributable to the solvents used for the pesticide formulations. Dibutox was found to persist in water for over 5 months, and DDT for over 4 months. The lindane concentration decreased by 70-75% in 131 days. Pesticides in water increase the BOD5 values in concentrations over 0.02 mg/l. In concentrations above 1 mg/l, many pesticides stimulate the bacterial flora, while inhibition occurs usually at concentrations over 1 g/l. Coli bacteria were stimulated, while enterococci and bacteriophages of *E. coli* and *B. typhi* were either unaffected or slightly inhibited by pesticides in water. Dipterex caused 90% mortality of *Daphnia magna* Strauss in 48 hours when added to water in 0.001 mg/l concentrations. Daphnia proved to be more susceptible to DDT and dibutox than fish, while the latter were more susceptible to DNOC than daphnia.

See also 75-1813 75-1830 75-1847 75-1852

75-2014. Thornburg, W. (Del Monte Corp. Res. Cent., Walnut Creek, CA 94598). **Pesticide residues.** *Anal. Chem.* 47(5): 157-169; 1975. (356 references)

Publications occurring in the field of pesticide methodology during the 2-year period from November 1972 through November 1974 are briefly annotated. Papers are presented which will be most useful to the residue analyst. Papers are arranged in the following categories: gas chromatography; chlorinated pesticide, general procedures, and specific procedures; organophosphorus pesticides, general procedures, specific compounds and procedures; carbamates; herbicides, acaricides; fungicides; and miscellaneous pesticides.

75-2015. Karlhuber, B. A.; Eberle, D. O. (Ciba-Geigy Ltd., Agrochem. Div., Basel, Switzerland). **Advances toward automation of pesticide residue determinations.** *Anal. Chem.* 47(7): 1094-1102; 1975. (30 references)

The following analytical procedures used in pesticide residue determinations have been successfully mechanized: collection of air and water samples for continuous monitoring of pesticides in the environment; 1/1-partition and detection of solvent interface by electrodes which sense the change in conductivity; gel permeation cleanup for purification/separation of chlorinated pesticides in animal tissue extracts; determination of organophosphorus and carbamate insecticides by cholinesterase inhibition after manual extraction of cleanup; triazine residue determination in soil by mechanized extraction, cleanup, and gas-liquid chromatography (GLC); and cleanup by sweep-codistillation. With the exception of the triazine soil procedure, these systems are not truly automated. In the triazine soil procedure, manual operations have been completely eliminated except for sample-volume adjustment and transfer before GLC. It allows analysis of 80 samples per day, each containing 0.02-40 ppm of parent triazine herbicide residues. Direct calculation from GLC output and print-out of results are automated except for the manual transfer of a punched tape.

75-2016. Farrow, J. E.; Hoodless, R. A.; Hopkinson, A. (Dep. Ind., Lab. Govern. Chemist, London, England). **Fungicide residues. Part IV. Determination of residues of carboxin in grain by gas chromatography.** *Analyst (London)* 100(1189): 249-252; 1975. (8 references)

A simple method for determining residues of carboxin in grain is presented. The carboxin is extracted from the sample with acetone in a Soxhlet extraction apparatus and, after concentration of the extract, is determined by gas-liquid chromatography using a nitrogen-selective detector. The presence of carboxin is confirmed by the use of a sulfur flame-photometric detector. (Author abstract by permission)

75-2017. Mestres, R.; Tourte, J.; Campo, M.; Illes, S. (Lab. Chim. Appl. Expert., Fac. Pharm., Montpellier, France). **Residus de pesticides, XXV. Methode polyvalente de recherche et de dosage des residus de pesticides divers dans les matieres alimentaires.** [**Pesticide residues, part 25. Multiple method for detecting and determining residues of various pesticides in foodstuffs.**] *Ann. Fals. Expert. Chim.* 67(721-722): 513-524; 1974. (10 references) (French)

A universal method for the extraction, detection, and determination of pesticide residues in food products is described. Following a double extraction with a mixture of ethylacetate with 20% dichloromethane, the first crude extract can be used for direct residue analysis, especially in the case of organophosphorus pesticides. Increased selectivity and sensitivity can be achieved by transferring this extract to acetonitrile and washing it with petroleum ether, after which the extract is diluted with water and reextracted with equal ratios of petroleum ether and sulfur ether, and with dichloromethane. The extracts are then analyzed by gas chromatography using phosphorus-, sulfur-, nitrogen-, or chlorine-specific detectors. Organochlorine pesticide residues can be detected by means of electron capture detector following fractionation of the extract obtained with petroleum ether and sulfur ether on florisil chromatographic column.

75-2018. Mestres, R.; Tourte, J.; Campo, M.; Illes, S.; Cornet, R. (Lab. Chim. Appl. Expert., Fac. Pharm., Montpellier, France). **Residus de pesticides, XXVI. Note sur le dosage des residus de thiabendazole dans les agrumes et les bananes.** [**Pesticide residues, part 26. Note on the determination of thiabendazole residues in citrus fruits and bananas.**] *Ann. Fals. Expert. Chim.* 67(723-724): 585-598; 1974. (7 references) (French)

A method for the determination of thiabendazole in skins, pulp, and juice of citrus fruits and bananas is described. Following extraction with ethylacetate in ammonia, the extract is cleaned up by twofold passage in acidic aqueous solution. Thiabendazole in fruit skin is determined by UV spectrophotometry between 260 and 360 nm, with a peak at 303 nm, and two weak shoulders at 295 and 318 nm. The recovery rate is 98%, and the sensitivity is 0.1 mg/kg. For fruit pulp and juice, the recovery rate is 80%, and the limit of detection is 0.05 mg/kg while reliable quantitative determination has a lower limit of 0.2 mg/kg. The method is specific even in the presence of benomyl, thiophanate, and ethoxyquine. The UV spectrophotometric results can be verified by gas chromatography using sulfur-sensitive flame photometer of nitrogen-sensitive thermionic detector.

75-2019. Abou-Donia, M. B. (Dep. Physiol. Pharmacol., Duke Univ. Med. Cent., Durham, NC 27710). **Ultraviolet spectroscopic studies of DDT-type compounds.** *Appl. Spectrosc.* 29(3): 261-264; 1975. (16 references)

The ultraviolet absorption spectra of DDT-type compounds, some of which have been reported as DDT breakdown products, are reviewed. In this work the spectroscopic properties of DDT-type compounds are studied

in relation to their chemical structures. The compounds studied included: acaralate, acarol, bulan, *p*-CBP, chlorobenzilate, Cl-DDT, *o,p'*-CPA, DBH, DBP, DDA, *p,p'*-DDD, *o,p'*-DDD, *m,p'*-DDD, *p,p'*-DDE, *o,p'*-DDE, DDM, DDMU, DDNU, DDOH, *p,p'*-DDT, *o,p'*-DDT, DMC, Dimite, DPM, DPT, HBP, HDM, Kelthane, Dicofol, Methoxychlor, Perthane, and prolan. The positions of λ*max*, molar absorptivity (ξ), and the possible assignments of the obtained transitions for DDT-type compounds are listed. DDT-type compounds can be classified as saturated compounds; carbonyl compounds; phenolic compounds; and unsaturated compounds. The spectra of each classification is discussed in detail.

75-2020. Okuno, I.; Wilson, R. A.; White, R. E. (U.S. Fish Wildlife Serv., Wildlife Res. Cent., Denver, CO). **Determination of zinc phosphide in range vegetation by gas chromatography.** *Bull. Environ. Contam. Toxicol.* 13(4): 392-396; 1975. (3 references)

A method has been developed which allows the measurement of as little as 0.01 μg of zinc phosphide in 1 g samples of shortgrass range vegetation (foliage of grass and small forbs). A 1-g sample of foliage is sealed in a flask and acidified with hydrochloric acid to hydrolyze the zinc phosphide present to phosphine gas. This gas is sampled from the headspace and measured by gas chromatography with a flame photometric detector. The use of finely ground sugar as the solvent matrix for the zinc phosphide secondary standard was discontinued and these standards were subsequently prepared in water. To reduce internal pressures within the reaction flasks and thereby minimize the possibility of erroneously low results, a volume of air was withdrawn from the flask prior to adding the acid. Recoveries from fortified foliage samples varied from 55 to 100%; the average recovery was higher in fresh samples than in those allowed to dry overnight.

75-2021. Khan, S. U.; Greenhalgh, R.; Cochrane, W. P. (Chem. Biol. Res. Inst., Canada Agric., Ottawa, Ontario, Canada). **Determination of linuron residue in soil.** *Bull. Environ. Contam. Toxicol.* 13(5): 602-610; 1975. (11 references)

Soil samples representing a range of texture and organic matter content were spiked with linuron, which was analyzed by gas chromatography. In a second experiment, the thermal decomposition of pure linuron in stagnant air or nitrogen was studied. In the first experiment, the best results were obtained with a 38 cm, 1.5% XE-60 gas chromatographic column. The response of the electron capture detector was linear in the range of 0.05 to 0.4 ng, and the least detectable amount of linuron was of the order 0.28×10^{-12} g/sec. The decomposition of linuron was minimized with direct on-column injection (as opposed to injection on silonized class wool prepacking) at a temperature of 165°C. Recoveries of linuron residues from the soil samples at the 0.1 ppm level ranged from 80 to 97%. Several unknown peaks appeared in the chromatograms but they did not interfere with the linuron peak (retention time, 3.5 min). Methanol gave higher recovery of linuron residues from air-dried field treated soils than any other solvent or mixture of solvents; the best extraction method was mechanical shaking of the air-dried soil. A moisture content of 20-30% improved extraction from the mineral soils, but residue recovery from the organic soils was not affected by the addition of water. The time interval between the addition of water to the air-dried mineral soils and extraction by methanol had little effect on the recovery of linuron residues. Thermogravimetric analysis revealed that the thermal decomposition of linuron started at 122°C in nitrogen; air and 116°C in the decomposition was complete by about 220°C.

75-2022. Zakrevsky, J. G.; Mallet, V.* (Univ. Moncton, Moncton, New Brunswick, Canada). **An in situ fluorometric method for the analysis of Bayrusil in foodstuffs.** *Bull. Environ. Contam. Toxicol.* 13(5): 633-637; 1975. (10 references)

Samples of apples, lettuce, tomatoes, cucumbers, and beans were homogenized and extracted with acetonitrile. The extracts were cleaned up on Florisil columns and the eluates were spotted on silica gel chromatographic plates. The plates were then heated in warm air and exposed to UV light in show spots of fluorescence indicative of the presence of Bayrusil. Recoveries of the pesticide at the 0.02 ppm level ranged from 98 to 107%; higher than normal recoveries were partially attributable to background interference. Reproducibility of the results was compared with reproducibility of the results obtained with the gas chromatographic procedure generally used for the analysis of Bayrusil. The fluorometric method was also superior to the gas chromatographic method in terms of recovery, speed, and simplicity.

75-2023. Dutripon, E. (Author address not given). **Analyse des pesticides par chromatographie liquide a grande vitesse.** [**Pesticide analysis by high-speed liquid chromatography.**] *Chim. Actual.* 1548: 45-47; 1975. (French)

The principle and advantages of liquid chromatography, and some analytical data on pesticide residues in water are presented. Due to its flexibility and high accuracy, liquid chromatography, often complementing gas chromatography, is a valuable tool in production control, especially in the food processing industry. Refractometric or UV detectors or both are used for the analysis, and alkanes, mainly hexane and iso-octane, are used as solvents. The DDT and PCB residue analysis in water samples from the Mediterranean and the North Atlantic show a considerable reduction of the overall pollution level from 1972 to 1974. Due to their liposolubility, organochlorine pesticides in water are accumulated in Cetacea and predatory birds.

75-2024. Still, G. G.; Mansager, E. R. (Metab. Radiat. Res. Lab., State Univ. Stn., Fargo, ND 58102). **High performance liquid and gas liquid chromatography applied to the purification of pesticide plant and animal metabolites.** *Chromatographia* 8(3): 129-135; 1975. (10 references)

New methods for isolating and purifying plant and animal pesticide metabolites have been developed. Polar conjugates such as glycosides, glucuronides, and sulfate esters, from plant or animal metabolism studies, have been purified either as the intact conjugates or as derivatives of the enzyme hydrolyzed conjugates by using a combination of high performance liquid chromatography or gas liquid chromatography. The methods developed for the isolation and characterization of plant and animal metabolites of isopropyl-3-chlorocarbanilate are described.

75-2025. Barabas, S. (Canada Centre Inland Waters, Burlington, Ontario, Canada). **Advances in the detection of water pollutants.** *Chem. Can.* 27(6): 26-29; 1975. (45 references)

This report summarizes the progress made by the scientific staff of the Canada Centre for Inland Waters in the various fields of analytical specialization. The fields reviewed are: chromatography/mass spectromety; spectrophotometry including UV, visible, molecular fluorescence, IR, and atomic absorption; electroanalytical methodology; biological methods; radiochemistry; electron microscopy; and remote sensing.

75-2026. Popendorf, W. J.; Spear, R. C.*; Selvin, S. (Dep. Biomed. Environ. Health Sci., Sch. Public Health, Univ. California, Berkeley, CA). **Collecting foliar pesticide residues related to potential airborne exposure of workers.** *Environ. Sci. Technol.* 9(6): 583-585; 1975. (13 references)

A technique is presented for collecting foliar dust samples for pesticide residue analysis. The proposed procedure is intended to collect that fraction of the foliar residue that can become airborne due to the activity of workers engaged in harvesting or thinning crops. The foliar dust levels measured by this procedure were experimentally shown to be highly correlated with airborne dust concentrations. The variability of replicated measurements of foliar dust levels using this technique was experimentally estimated. Dust level data collected over a five-month period using the new procedure in the Central Valley of California shows increasing levels on citrus foliage over the spring and summer months. (Author abstract reprinted by permission of the American Chemical Society)

75-2027. Khan, S. U.; Greenhalgh, R.; Cochrane, W. P. (Chem. and Biol. Res. Inst., Res. Branch, Can. Agric., Ottawa, Ontario, Canada). **Chemical derivatization of hydroxyatrazine for gas chromatographic analysis.** *J. Agric. Food Chem.* 23(3): 430-434; 1975. (9 references)

The reaction conditions for silylation, methylation, and alkylation of hydroxyatrazine [2 - hydroxy - 4 - (ethylamino) - 6 - (isopropylamino) - *s* - triazine] were examined and the resultant derivatives were analyzed by gas chromatography using an alkali flame ionization detector (AFID). The silylated derivatives lowered the detector sensitivity considerably. Methylated or alkylated derivatives of hydroxyatrazine can be readily gas chromatographed. A method was developed for the simultaneous detection of atrazine [2 - chloro - 4 - (ethylamino) - 6 - (isopropylamino) - *s* - triazine] and hydroxyatrazine at residue levels in soil by gas chromatography. The procedure is based on the extraction of sample with methanol and separation of atrazine and hydroxyatrazine in the extract by column chromatography on acidic alumina. This is followed by derivatization of the separated compounds, column clean-up on silica gel, and subsequent determination by gas chromatography. The lower limit of sensitivity for both atrazine and hydroxyatrazine by this method is approximately 0.5 ppm. The alkylation reaction developed can also serve as a useful chemical confirmatory test for *s*-trazines and their hydroxy analogs in biological systems. (Author abstract reprited by permission of the American Chemical Society)

75-2028. Ochler, D. D.; Holman, G. M. (Vet. Toxicol. Entomol. Res. Lab., Agric. Res. Serv., College Station, TX 77840). **Residue determination of Thompson-Hayward 6040 in bovine manure by high performance liquid chromatography.** *J. Agric. Food Chem.* 23(3): 590-591; 1975.

Residues of TH 6040 1-(4-chlorophenyl)-3-(2,6-difluorobenzoyl)urea, were determined in bovine manure at levels between 2.0 and 0.5 ppm. Samples were cleaned up by liquid-liquid partition and elution through a Florisil column. Analysis was performed with reverse-phase high performance liquid chromatography. (Author abstract reprinted by permission of the American Chemical Society)

75-2029. Devine, J. M. (Lake Ontario Environ. Lab., State Univ. New York, Coll. Arts and Sci., Oswego, NY 13126). **Determination of residues of 2-(*p-tert*-butylphenoxy)cyclohexyl propargyl sulfite (Omite) in peanuts, cottonseed, and corn.** *J. Agric. Food Chem.* 23(3): 598-599; 1975. (2 references)

A gas chromatographic method is presented for the determination of 2-(*p-tert*-butylphenoxy)cyclohexyl propargyl sulfite (Omite, propargite) in peanuts, cottonseed, and corn. After extraction, lipid material is removed by actonitrile-hexane partition steps. Further cleanup is accomplished by passing the extract through a Florisil column. An alumina column is then used for peanut extracts. Final determination is made with a gas chromatograph equipped with a sulfur-specific flame photometric detector. Recovery of Omite from the three crops aveaged 95%. The limit of detection was 0.1 ppm. (Author abstract reprinted by permission of the American Chemical Society)

75-2030. Moye, H. A. (Dep. Food Sci., Univ. Florida, Gainesville, FL 32611). **Esters of sulfonic acids as derivatives for the gas chromatographic analysis of carbamate pesticides.** *J. Agric. Food Chem.* 23(3): 415-418; 1975. (14 references)

Esters of sulfonic acids (sulfonates) may be readily prepared on a micro scale by reacting benzenesulfonyl chlorides with carbamate pesticides. The sulfonates are easily gas chromatographed and detected by a tritium electron capture detector at the 1-pg level. Flame photometric detection may also be employed at the 10-ng level. A simple analytical procedure for the analysis of carbamates on lettuce and cabbage is described; it can be adapted to other materials, such as soils. A sensitivity of 0.05 ppm is easily achieved. (Author abstract reprinted by permission of the American Chemical Society)

75-2031. Trotter, W. J. (Div. Chem. and Phys., Food and Drug Adm., Washington, D.C. 20204). **Removing the interference of DDT and its analogs in the analysis for residues of polychlorinated biphenyls.** *J. Assoc. Off. Anal. Chem.* 58(3): 461-465; 1975. (11 references)

A micro scale procedure is described for quantitatively separating polychlorinated biphenyls (PCBs) from DDT and its analogs. DDT and TDE are initially dehydrochlorinated with ethanolic KOH to their respective olefins, DDE and TDE-olefin (1-chloro-2,2-bis(*p*-chlorophenyl)ethylene). The olefins are then oxidized by CrO_3 in acetic acid to the more polar dichlorobenzophenone. PCBs are eluted from a micro Florisil column with petroleum ether. Typical recoveries in the ppm range (based on a 5 g sample) were >80% for Aroclors 1254 and 1260. Recoveries generally were poorer with Aroclors of lower chlorine content and decreased with decreasing quantity of Aroclor present. The DDT group was not quantitatively determined; recoveries averaged ≥60% for the DDT group in the ppm range (based on a 5 g sample). The procedure was successfully applied to samples of Lake Michigan chubs containing residues of PCBs and the DDT group and to extracts of human serum fortified with Aroclors and the DDT group. (Author abstract by permission)

75-2032. Hofberg, A. H., Jr.; Heinrichs, L. C.; Gentry, G. A. (Ciba-Geigy Corp., Greensboro, NC 27409). **Collaborative study of a gas-liquid chromatographic method for the analysis of propazine.** *J. Assoc. Off. Anal. Chem.* 58(3): 513-515; 1975. (6 references)

A gas-liquid chromatographic method for the determination of propazine in wettable powder formulations containing about 80% active ingredient was collaboratively studied, using a matched pair scheme. The propazine was extracted from the powder with chloroform, with dieldrin as an internal standard, and chromatographed on Carbowax 20M, using a flame ionization detector. Two samples were analyzed using peak height measurements with the following results (13 collaborators): 1.2% overall coefficient of variation and 1.2% coefficient of variation for the random error. Statistical evaluation of these factors reveals no evidence of systematic error contribution. The method has been adopted as official first action. (Author abstract by permission)

75-2033. Hofberg, A. H., Jr.; Heinrichs, L. C.; Gentry, G. A. (Ciba-Geigy Corp., Greensboro, NC 27409). **Collaborative study of a gas-liquid chromatographic method for the analysis of chlorobenzilate and chloropropylate.** *J. Assoc. Off. Anal. Chem.* 58(3): 516-519; 1975. (6 references)

A gas-liquid chromatographic method for the determination of chlorobenzilate and chloropropylate in liquid formulations containing about 46 and 26% active ingredient, respectively, was collaboratively studied, using a matched pair scheme. The samples were dissolved in acetone containing dibenzyl succinate as an internal standard and chromatographed on Carbowax 20M, using a flame ionization detector. Analyses of 4 samples by 13 collaborators using peak height measurements showed the following results; chlorobenzilate—2.5% overall coefficient of variation, 1.0% coefficient of variation for the random error, and 0.7% systematic error; chloropropylate—2.0, 1.4, and 0.4%, respectively. The method has been adopted as official first action. (Author abstract by permission)

75-2034. Holmstead, R. L.; Casida, J. E. (Div. Entomol. Parasitol., Univ. California, Berkeley, CA 94720). **Chemical ionization mass spectrometry of *N*-methylcarbamate insecticides, some of their metabolites, and related compounds.** *J. Assoc. Off. Anal. Chem.* 58(3): 541-547; 1975. (13 references)

The chemical ionization (CI) mass spectra with methane as the reagent gas are reported for 25 *N*-methylcarbamate insecticides or related compounds. The $[M + 1]$ ions in the CI spectra are larger than the parent ions in the corresponding electron impact (EI) spectra of *N*-methyl- and *N*,*N*-dimethylcarbamates, but the contrary is true with *N*-hydroxymethylcarbamates. CI but not EI fragmentation of substituted-phenyl *N*-hydroxymethylcarbamates $[ROC(O)NHCH_2]$ appears to involve a 4-membered $[ROC(O)NHCH_2]$intermediate which rearranges to give a $[ROCH_2]+$ fragment. Other fragmentations unique to the CI spectra are also discussed. (Author abstract by permission)

75-2035. Kurhekar, M. P.; D'Souza, F. C.; Meghal, S. K. (Reg. Forensic Sci. Lab., State of Maharashtra, Civil Lines, Nagpur, India). **Rapid method for extracting aldrin, dieldrin, and endrin from visceral material.** *J. Assoc. Off. Anal. Chem.* 58(3): 548-550; 1975. (20 references)

A simple method is described for purifying aldrin, dieldrin, and endrin from visceral material by using a Celite column. Celite retains all interfering materials including lipids whereas the chlorinated insecticides are eluted from the column with *n*-hexane. The extract can be used

directly for gas chromatographic analysis. (Author abstract by permission)

75-2036. Adler, I. L.; Wargo, J. P., Jr. (Res. Lab., Rohm and Haas Co., Bristol, PA 19007). **Determination of residues from the herbicide 2,4-dichloro-1-(4-nitrophenoxy)-benzene in rice and wheat by electron capture gas-liquid chromatography.** *J. Assoc. Off. Anal. Chem.* 58(3): 551-553; 1975. (2 references)

A residue method has been developed which is capable of determining not only 2,4-dichloro-1-(4-nitrophenoxy)-benzene but a majority of the known metabolites of this compound. The residues are reduced to a common amine intermediate which is further derivatized and quantitatively measured by electron capture gas-liquid chromatogaphy. The method is sensitive to 0.01 ppm and is readily suited to routine use. The method has been used on rice and wheat samples. (Author abstract by permission)

75-2037. Zakrevsky, J. G.; Mallet, V. N. (Dep. Chem., Univ. Moncton, Moncton, New Brunswick, Canada). **Determination of coumaphos and its oxygen analog in eggs by in situ fluorometry.** *J. Assoc. Off. Anal. Chem.* 58(3): 554-556; 1975. (5 references)

A method is reported for the simultaneous determination of coumaphos (*O,O* - diethyl *O* - (3 - chloro - 4 - methyl - 2 - oxo - 2*H* - 1 - benzopyran - 7 - yl) phosphorothioate) and its oxygen analog, Coroxon, in eggs in the ppb range. The residues are extracted with acetone and chloroform. The extract is purified by liquid-liquid partition followed by column chromatography and then by 2-dimensional thin layer chromatography. The fluorescence is measured directly on the chromatogram. (Author abstract by permission)

75-2038. Bong, R. L. (Food and Drug Adm., Minneapolis, MN 55401). **Determination of hexachlorobenzene and mirex in fatty products.** *J. Assoc. Off. Anal. Chem.* 58(3): 557-561; 1975. (11 references)

A procedure is described for the isolation and cleanup of hexachlorobenzene (HCB) and mirex in fats and oils for gas-liquid chromatographic (GLC) analysis. The fat or oil is distributed on unactivated Florisil, and the HCB and mirex are eluted with acetonitrile. The pesticides are then partitioned into petroleum ether. Elution through activated Florisil with methylene chloride-hexane (20+80) is used for the final cleanup. HCB and mirex are then measured by GLC, using the appropriate electron capture conditions with a 15% OV-210 column for HCBf and a 3% OV-101 column for mirex. The method demonstrates recoveries greater than 90% for HCB and mirex and allows screening at or below the 0.1 ppm level in fats with a 3 mg fat injection. (Author abstract by permission)

75-2039. Holden, E. R. (Agric. Environ. Qual. Inst., Agric. Res. Serv., Beltsville, MD 20705). **Collaborative study of the 2,4-dinitrophenyl ether multiresidue method for use in determining four carbamate pesticides in crops.** *J. Assoc. Off. Anal. Chem.* 58(3): 562-565; 1975. (3 references)

Eight laboratories tested the 2,4-dinitrophenyl ether method for determining carbamate pesticide residues by gas-liquid chroamtography. Propoxur, carbofuran, carbonolate, and carbaryl in apples, corn, green beans, and a leafy vegetable (kale, collards, cabbage, or turnip greens) were determined at the fortification levels of 0.1, 0.2, and 0.5 ppm. Average recoveries of propoxur were 87-95%; carbofuran, 87-100%; carbanolate, 89-102%; and carbaryl, 77-92%. No serious background problems were encountered, other than that from field-incurred carbaryl residues in apples. The study revealed the need for certain precautions in determining carbaryl because of its instability in analytical operations. The method has been adopted as official first action. (Author abstract by permission)

75-2040. Nash, R. G. (Agric. Environ. Qual. Inst., Agric. Res. Serv., Beltville, MD 20705). **Gas-liquid chromatographic method for determining ethylenethiourea in plants.** *J. Assoc. Off. Anal. Chem.* 58(3): 566-571; 1975. (6 references)

An additional gas-liquid chromatographic method has been developed for determining ethylenethiourea (ETU) in plants. Two ETU derivatives,e and 2-(benzylthio)-1-(pentafluorobenzoyl)-2-imidazoline, can be prepared from the same extract, which allows confirmation of the presence and quantity of ETU at >5 ppb. No degradation of the parent fungicides to ETU during benzylation or *o*-chlorobenzylation was observed. (Author abstract by permission)

75-2041. Smith, A. E. (Agric. Canada, Res. Stn., Regina, Saskatchewan, Canada). **A multi-residue extraction procedure for the gas chromatographic determination of the herbicides dichlobenil, dinitramine, triallate and trifluralin in soils.** *J. Chromatogr.* 97: 103-106; 1974. (16 references)

A multi-residue extraction procedure for the gas chromatographic determination of the herbicides dichlobenil, dinitramine, triallate, and trifluralin in soils is described. Typical gas chromatograms obtained from the standard solution containing 0.01 ng/μl of each herbicide, and from Jamesons sandy loam fortified at the level of 0.05 ppm, indicated that the 10% OV-1 column gave a good resolution of the individual herbicides. Although resolution between dinitramine and triallate was not complete, adequate quantitative measurements could be made. Recoveries of the four herbicides from treated soils were all greater than 90%, and reproducibility was excellent. Separate experiments showed that no interfering substances were detected in any of the untreated soils, even at the high attenuations required for the analysis of the lower concentrations of herbicides in the soils.

75-2042. Henshaw, B.; Que Hee, S. S.; Sutherland, R. G.; Lee, C. C. (Dep. Chem. Chem. Eng., Univ. Saskatchewan, Saskatoon, Saskatchewan, Canada). **Gas-liquid chromatography and gas-liquid chromatography combined with mass spectrometry of a butyl ester formulation of (2,4-dichlorophenoxy)acetic acid.** *J. Chromatogr.* 106: 33-39; 1975. (12 references)

A method is presented for the analysis of (2,4-dichlorophenoxy)acetic acid (2,4-D) in commercial formulations, together with concurrent detection and quantitation of related compounds. The method is based on direct gas-liquid chromatographic (GLC) analysis of the formulation to estimate the various esters present, and on an analysis of the total 2,4-D present involving a prior cleanup, alkaline hydrolysis, acidification and *n*-butylation steps. This procedure also quantitates any other related acids or phenols present. A step which would extract dioxin impurities is also included. The method was checked by the accepted acid-base estimation of 2,4-D content, GLC, and by subjecting radioactive-labelled herbicide to the above procedures. (Author abstract by permission)

75-2043. Buser, H. R.; Arn, H. (Swiss Fed. Res. Stn. for Arboric., Vitic., and Hortic., Wadenswil, Switzerland). **Analysis of insect pheromones by quadrupole mass fragmentography and high-resolution gas chromatography.** *J. Chromatogr.* 106: 83-95; 1975. (11 references)

A sensitive technique is described for the analysis of insect pheromones. Insect extracts are separated into fractions by column chromatography and are analyzed directly by quadrupole mass fragmentography on high-resolution glass capillary columns and by mass spectrometry. Applications are illustrated with two important pests. In the codling moth, *trans*-8,*trans*-10-dodecadien-1-ol was found to be present at a level of 3.5 ng per female, and in the European grapevine moth *trans*-7,*cis*-9-dodecadienyl acetate at a level of 1.6 ng. Both compounds appear to be present in high isomeric purity in the female insect and are absent in the corresponding males. (Author abstract by permission)

75-2044. Leoni, V.; Puccetti, G.; Grella, A. (Ist. Igiene "G. Sanarelli", Univ. Roma, Rome, Italy). **Preliminary results on the use of Tenax for the extraction of pesticides and polynuclear aromatic hydrocarbons from surface and drinking waters for analytical purposes.** *J. Chromatogr.* 106: 119-124; 1975. (15 references)

The use of Tenax GC (a porous polymer based on 2,6-diphenyl-*p*-phenylene oxide) for the extraction of organic micro-pollutants such as pesticides and polynuclear aromatic hydrocarbons from water has been studied. In the absence of other contaminants and under conditions standardized at the time as optimal, the recovery of such substances is, on the average, over 90%, both for the organochlorine and organophosphorus pesticides and for polynuclear aromatic hydrocarbons. Research into the effectiveness of extraction with Tenax from natural waters and water artificially contaminated with surfactants, fats and oils etc., in the laboratory is now being carried out. (Author abstract by permission, supplemented)

75-2045. Wilson, B. P.; Cochrane, W. P. (Anal. Serv. Sect., Plant Prod. Div., Agric. Can., Ottawa, Ontario, Canada). **Comparison of the Coulson and Hall electrolytic conductivity detectors for the determination of nitrogen-containing pesticides.** *J. Chromatogr.* 106: 174-179; 1975. (7 references)

The Coulson and Hall electrolytic conductivity detectors were compared in relation to the effects of hydrogen flow-rate, solvent flow-rate, and furnace temperature on the response of some nitrogen-containing pesticides in the nitrogen mode of operation. The optimum conditions for operation of the Hall detector were found to be 900°C furnace temperature, 30 ml/min hydrogen flow-rate, and 0.7 ml/min solvent flow-rate. Under these conditions 1.9 ng atrazine gave an 85% f.s.d. (full-scale deflection) and 1/2 f.s.d occurred at 1.1 ng. The responses of some nitrogen-containing pesticides under these conditions were determined. In each case, a significant increase in response over that obtained with the Coulson detector was observed; this ranged from a 3.8-fold increase for Bladex to a 12.5-fold increase for chlorpropham. Overall, the response increased by a factor or 7.

75-2046. Edwards, T.; Merilees, H. L.; McBride, B. C. (Dep. Microbiol., Univ. British Columbia, Vancouver, British Columbia, Canada). **Rapid, sensitive method for the separation and detection of arsenic compounds in biological systems.** *J. Chromatogr.* 106: 210-212; 1975. (5 references)

A simple, rapid, one-step procedure for identifying arsenic compounds in complex biological systems has been developed. Samples of distilled water or domestic sewage sludge containing sodium arsenate, sodium arsenite, sodium methyl arsonate, or sodium cacodylate were prepared. The samples were centrifuged and the supernatants analyzed by electrophoresis on nonfluorescent cellulose thin-layer chromatographic sheets. At pH 7.0, arsenate, methylarsonate, and cacodylate migrated to the anode; arsenite moved to the cathode. Assigning arsenate a mobility of 1.0, methylarsonate and cacodylate had relative mobilities of 0.86 and 0.47, respectively. In addition, methylarsonate appeared as a light blue spot, while arsenate was dark blue. Sodium tellurate, sodium nitrate, sodium nitrate, sodium sulfite, and sodium sulfate did not interfere with migration or form colored complexes with the developing reagents. Sodium phosphate appeared as a blue spot with a relative mobility of 0.84. Large quantities of contaminating salt, protein, lipid, and carbohydrate had no adverse effects on the system.

75-2047. Allebone, J. E.; Hamilton, R. J. (Chem. Dep., The Polytechnic, Liverpool, England). **Determination of**

2,4-D in plant tissue. I. *J. Chromatogr.* 108(1): 188-193; 1975. (7 references)

To study the penetration of 2,4-D through leaf surface waxes, it is necessary to use a good method for the quantitative determination of the herbicide. Determination of 2,4-D in plant matter is difficult as it is hard to completely remove pigments and other metabolites which interfere with the analysis. In order to ensure complete removal of the herbicide from the plant, an exhaustive extraction procedure was used. The plant matter (20 g) was macerated with warm methanol (100 ml) and conc. HCl (1-2 ml) 3 times in a Waring blender for 4 min, filtering after each extraction. The solid residue was refluxed with 25% sodium hydroxide (20 ml) for 30 min to hydrolyze any 2,4-D/protein complexes, filtered, and the brownish solution was acidified with hydrochloric acid. The original methanol extracts were combined and concentrated to 20 ml under reduced pressure, then refluxed with 25% sodium hydroxide (20 ml) for 30 min to hydrolyze 2,4-D esters and other complexes. The resulting solution was filtered, acidified, and combined with the acidified alkaline extract. The volume of this solution was adjusted to 200 ml with water and extracted with chloroform. The dark green chloroform extract was purified before analysis on the electron capture gas-liquid chromatograph. The 2,4-D methyl ester had an *Rf* value of 0.35-0.40. By using this method it was possible to show that 2,4-D could be detected at levels as low as 0.04 ppm with recoveries from 80-96% when it was present with a variety of plant extracts.

75-2048. Wakimoto, T.; Tatsukawa, R.; Ogawa, T.; Watanabe, I. (Dep. Agric. Chem., Fac. Agric., Ehime Univ., Tarumi, Japan). [**Determination of organochlorine pesticides and PCB in air by dry column collection method.**] *Bunseki Kagaku (Jpn. Anal.)* 23(7): 790-793; 1974. (4 references) (Japanese)

A new collection method is presented for determining trace amounts of organochlorine compounds, such as BHC, DDT, and PCB, in air. A column packed with 5%-(w/w) glycerine-coated florisil is used to quantitatively collect organochlorine compounds in air. Detection limits are 0.0005 $\mu g/m^3$ for BHC isomers and 0.002 $\mu g/m^3$ for PCB. This dry collection method is more sensitive, inexpensive and easier to use than the impinger method. Minor modifications of this method make it applicable to other air pollutants such as organophosphorus compounds and phthalic acid esters.

75-2049. Kroeller, E. (Bundesgesundheitsamt, Max v. Pettenkofer-Institut, Berlin, Germany). **Untersuchungen zur Bestimmung von 2-Aminobutan auf den Schalen von Apfelsinen.** [**Studies concerning determination of 2-aminobutane on orange peels.**] *Deut. Lebensm.-Rundsch.* 71(3): 112-113; 1975. (10 references) (German)

A method used to analyze residues of 2-aminobutane (a mildew preventative) on orange peels is described. The active substance is isolated with an exchanger resin after extraction by means of acid. After elution and concentration, a yellow color is produced by reaction with 1-fluoro-2,4-dinitrobenzene. Spectrophotometry is the means used for measuring its intensity. This method allows detection of 2-aminobutane residues of as little as 0.05 ppm.

75-2050. Dulak, K. (Res. Inst. Agrochem. Technol., Bratislava, Czechoslovakia). **Polarographic determination of 4,5-dichloro-2-phenyl-3(2H)-pyridazinone.** *Fresenius' Z. Anal. Chem.* 274(2): 123-124; 1975. (6 references)

A polarographic determination method for 4,5-dihydro-2-phenyl-3(2H)-pyridazinone, an intermediate product in the preparation of pyrazon, is presented. 4,5-Dichloro-2-phenyl-3(2H)-pyridazinone, (90-105 mg) technical product, is weighed into a 250 ml volumetric flask and dissolved in a small quantity of warm methanol. After dissolving it is equilibrated to a given temperature and the flask is filled up to the mark. From the solution prepared in this way, 25 ml are pipetted into a 100 ml volmetric flask; 25 ml of methanol, 30 ml of Sorensen's phosphate buffer solution pH 7.1, and 1 ml of 1% gelatin solution are successively added. The flask is filled up to the mark with methanol. After 10 min bubbling with pure nitrogen it is subjected to polarography. During this procedure the nitrogen atmosphere is kept above the level of the solution. The starting point of the curves is -0.8 V. Sensitivity is 1/200.

75-2051. Monitoring Panel, Federal Working Group on Pest Management (Washington, DC). **Guidelines on sampling and statistical methodologies for ambient pesticide monitoring.** *U. S. Government Printing Office,* 1975, 45p. (25 references)

This report comprises a set of guidelines established to fulfill the need for a standardized approach to sampling methodologies for the respective environmental components of the national pesticide monitoring program. It makes allowance for the variability encountered in sampling various media from different geographic regions and with different program objectives. The guidelines apply primarily to ambient or trend monitoring, defined as the repeated sampling and analysis of components of the environment to produce estimates of pesticide residue levels in these components and the changes in these levels over time. The guidelines were designed for use by people with some familiarity with field sampling operations, although not necessarily with ambient sampling for pesticide residues. Both the statistical aspects of sampling and the field sampling procedures necessary to implement a large scale monitoring program are considered. The report includes the following components: air, soil, water, estuaries, freshwater fish, birds, food and feed, and human tissues. The guidelines are developed around these components.

75-2052. Neumann, L.; Wagner, J. (Anal. Lab. Versuchsanst. Lehranst. Brau., Berlin, Germany). **Schnelle Bestimmung von Methylenchlorid im Hopfenextrakt durch gaschromatographische Dampfraumanalyse.** [**Rapid determination of methyl chloride in hop extract by gas chromatographic vapor space analysis.**] *Monatsschr. Brauerei* 27(7): 137-140; 1974. (6 references) (German)

A method for the rapid determination of methyl chloride in hop extract by gas chromatographic vapor space analysis is reported. Two ml of *n*-propanol and 1 g of hop extract are stirred in a small flask, and after the addition of 8 ml of water and 5 μl diethyl ether as internal standard, the whole is thoroughly mixed. The sample is taken from the vapor space after the mixture has been maintained at 40°C for about 30 min. Examination of 22 hop extracts showed good agreement with results from a comparison method. The standard deviation was found to be S= ± 0.1. Advantages of this method are the rapidity of the experiment and the saving of sample material, as well as the saving of solvents and coolants. The disadvantage proves to be the strict maintenance of the gas chromatographic working techniques. Tested extracts contained 0.06% to 2.92% methyl chloride and only one extract exceeded the maximum permitted level of 2.2%.

75-2053. Tsuchiya, K. (Inst. Biol., Nihon Noyaku Co., Ltd., Osaka, Japan). [**Determination of small amounts of pesticides by GC-MS.**] *Noyaku (Pesticides)* 22(2): 46-48; 1975. (19 references) (Japanese)

The determination of organic compounds by a GC-MS combination is summarized for organochlorine, organophosphorus, and carbamate insecticides; phenoxyacetic acid herbicides; and PCB. Organochlorine insecticides are very stable and difficult to metabolize biologically. The organochlorine insecticide residues in a biological body may be extracted using acetonitrile or petroleum ether, and the determination can be made by GC or GC-MS combination. Organophosphorus insecticides are readily metabolized in natural environment; therefore, there are only a few examples in which the original insecticide residues were determined from samples, and degradation products of insecticides are generally determined by GC-MS. GC-MS is one of the best techniques for determining a trace pesticide with high sensitivity.

75-2054. Hitzke, J.; Cambon, A.; Guion, J. (Lab. d'Electrochimie et de Chimie Physique de Corps Solide, Univ. L. Pasteur, Strasbourg, France). **Analyse en spectrometrie de masse de derives fluores en serie pyrimidine et triazine.** [**Mass spectrometric analysis of fluorine derivatives in the pyrimidine and triazine series.**] *Org. Mass Spectrom.* 9(4): 435-442; 1974. (15 references) (French)

All fluorinated derivatives of perchloropyrimidine, trichloro-2,4,6-pyrimidine, and perchloro-*s*-triazine were synthesized by successive nucleophilic substitution of chlorine atoms. Fluorine NMR analysis, combined with gas chromatography and mass spectrometry, allowed the separation, identification, and fragmentation of the products. The existence of isomers was established. The compounds synthesized and identified were trichlorofluoropyrimidine, dichlorodifluoropyrimidine, monochlorotrifluoropyrimidine, tetrafluoropyrimidine, fluoro-2-dichloro-4,6-*s*-triazine, difluoro-2,4-chloro-5-*s*-triazine, and trifluoro-2,4,6-*s*-triazine. Three different pathways of fragmentation were distinguished for all compounds.

75-2055. Botre, C.; Ielmini, M.; Mancini, G.; Bencivenga, B. (Ist. Chim. Farm., Univ. Roma, Rome, Italy). **Indagine sull'inquinamento da pesticidi nei fiumi Tevere ed Aniene.** [**Pesticide pollution of the Tiber and Aniene Rivers.**] *Rass. Chim.* 25(4): 331-335; 1973. (14 references) (Italian)

A preliminary study to evaluate the state of pesticide contamination in the Tiber and Aniene Rivers in Italy is presented. One day weekly between September and January, at preselected points, three liters of river water were extracted and analyzed for insecticide pollutants. The samples were acidified with concentrated HCl. The following day the actual extraction of insecticide residues was done. These weekly residue samples were combined in a single glass container which was studied at the end of each particular month to obtain a monthly average for each of the five months. The extraction was done with ether, benzene, and acetonitrile following by dehydration over anhydrous sodium sulfate. Gas chromatography followed. The results of gas chromatography showed lindane and *p,p'*-DDE in 93% of the samples, aldrin and *o,p'*-DDT in 91%, *p,p'*-DDT in 92%, and parathion in 90%. Temperatures during chromatography were 190°C in the column, 250°C in the injection block, and 300°C in the detector. The times of retention relative to aldrin were: lindane 0.55, aldrin 1.00, *p,p'*-DDE 2.04, *o,p'*-DDT 2.71, and *p,p'*-DDT 3.69.

75-2056. Piechocka, A (Dep. Food Invest., State Dep. Hyg., Warsaw, Poland). **Oznaczanie karbarylu w jablkach.** [**Determination of carbaryl in apples.**] *Rocz. Panstw. Zakl. Hig.* 24(4): 409-412, 1973. (11 references) (Polish)

A sensitive and simple method for the determination of carbaryl residues in apples by thin-layer chromatography with enzymatic detection is described. The compound is extracted from 100 g samples of thinly-sliced apples by homogenization in 300 ml of benzene. The extract (150 ml) is then purified by addition of purified charcoal (5 g) and anhydrous sodium sulfate (5 g), agitated for ½ hr, and concentrated to 2 ml by distillation using a water vacuum pump. The flask is rinsed repeatedly with benzene, and washings added to the sample, and the sample concentrated on a water bath at 50°C under vacuum. Standard and fortified samples (containing 5 μg = 0.05 mg/kg of carbaryl) are prepared at the same time. The benzene extracts (0.05 ml) and standards are placed on chromatog-

raphic plates (covered with a 0.2 mm layer of silica gel) and chromatographed to 15 cm from the starting line in a mixture of benzene and ethyl acetate (9 + 1) in a previously saturated chamber. After removal from the chamber the plates are dried for 15 minutes at room temperature, sprayed with enzyme solution (obtained from 1 g of fresh homogenized beef liver), incubated for 1 hour at 38°C, and sprayed with substrate (4 ml of β-naphthyl acetate, prepared by dissolving 125 mg of β-naphthyl acetate in 100 ml absolute ethanol) and 20 mg of fast blue dye dissolved in 16 ml of water. The light yellow spots of carbaryl on a violet background appear after several minutes. The *Rf* values are 0.33-0.34. The smallest detectable amount of carbaryl residue is 0.02 mg/kg.

75-2057. Zero, M. (Dep. Food Invest., State Dep. Hyg., Warsaw, Poland). **Pozostalosci simazinu i atrazinu w niektorych owocach i warzywach. [Residues of simazine and atrazine in certain fruits and vegetables.]** *Rocz. Panstw. Zakl. Hig.* 24(4): 413-417; 1973. (11 references) (Polish)

A thin-layer chromatographic method for the determination of simazine and atrazine residues in strawberries and carrots is described. The triazines are extracted from 100 g of sample with chloroform (250 ml) containing anhydrous Na_2SO_4 (10 g). The extract (125 ml) is condensed to 3 ml in a water bath at 50°C and then evaporated to dryness in a current of air at room temperature. The sample is purified with petroleum ether and acetonitrile. The acetonitrile is distilled off under vacuum in a water bath at 50°C. The dry sample is dissolved in carbon tetrachloride and chromatographed on a column packed with aluminum oxide. Carbon tetrachloride is gradually added (80 ml) and a vacuum applied. As a second solvent 100 ml of 5% ethyl ether in carbon tetrachloride is then used. The eluate is concentrated under vacuum to 1 ml. Samples (0.1 and 0.2 ml) of concentrated eluate are transferred onto silica gel plates placed in a chamber previously saturated with chloroform and acetone (9 + 1), and the solvent allowed to migrate to 15 cm. After drying at room temperature the plates are sprayed with a 0.5% solution of silver nitrate, subjected to UV for 30-60 minutes, sprayed with an aqueous solution of HNO_3 (1 part to 3 parts water), and again subjected to UV until appearance of gray spots. The *Rf* value for atrazine was 0.46; for simazine, 0.36. Recovery was approximately 90%. Using 5 g samples both atrazine and simazine residues can be detected in 0.25 μg amounts, corresponding to 0.05 mg/kg. Larger samples reduce recovery to 50% and lower detection to 0.5 μg due to darkening of plates.

75-2058. Wozniak, J.; Tokarz, A.; Podlesny, J. (Dep. Anal., Inst. Biofarm., Akad. Med., Warsaw, Poland). **Rozdzial trichlorfonu i DDVP metoda chromatografii gazowej. [Separation of trichlorfon and DDVP by the gas chromatographic method.]** *Rocz. Panstw. Zakl. Hig.* 26(2): 191-196; 1975. (6 references) (Polish)

Trichlorfon and DDVP (dichlorvos) separation and their quantitative determination by gas chromatography were studied. Partial breakdown of trichlorfon to DDVP was observed on a chromatographic column packed with 25% Carbowax 20 M on Gas-Chrom Q 80/100 mesh. This process must be taken into account in quantitative determinations of trichlorfon. The constant of trichlorfon breakdown was established as $k = 120/\text{min}$, and the half-time of breakdown is $\tau = 60$ min in normal saline, pH 7.4, at 37°C.

75-2059. Ikramov, L. T.; Mirkhaitov, T. (Tashkent Pharm. Inst., Tashkent, USSR). **Vliyanie konservirovaniya etanolom na sokhranyayemost' fozalona i ftalofosa v trupe. [The effect of ethyl alcohol preservative on the stability of phosalone and phthalophos in cadavers.]** *Sud.-Med. Ekspertiza* 16(3): 35-37; 1973. (Russian)

The organic insecticides phosalone and phthalophos were added to human cadaveric liver preserved with ethyl alcohol and left at room temperature. After 30 days, 31% of the initial phosalone quantity was detectable, and 10.5% was detected after five months. Corresponding values for phthalophos were 23 and 7%, respectively. The addition of ethyl alcohol does improve the conservability of these substances in cadaveric material.

75-2060. Weil, L.; Quentin, K.-E. (Inst. Wasserchem. Chem. Balneol., Tech. Univ. Munich, Munich, Germany). **Zur Analytik der Pestizide im Wasser. [Pesticide analysis in water.]** *Wasser-Abwasser-Forsch.* 7(5): 147-152; 1974. (11 references) (German)

A procedure for the sampling, extraction, clean-up, identification, and quantitative determination of organochlorine pesticide residues in water is described. Water should be sampled in glass or aluminum bottles; the use of plastic containers should be avoided due to loss as a result of adsorption. The residues are extracted by means of *n*-hexane. Clean-up, necessary for residue concentrations below 0.5 μg/l, is possible by column chromatography on a silica gel column, and using *n*-heptane-acetone in a 99:1 ratio for elution. Identification of the compounds is possible by comparison of the retention times by using fractograms with external standards, or by mass spectroscopic, peak group-specific analysis. Gas-chromatographic analysis is carried out by means of a linear electron-capture detector. Quantitative determination is most reliable by planimetry.

75-2061. Vasil'ev, A. F.; Pankova, M. B. (All-Union Sci. Res. Inst. Chemical Means Plant Protect., USSR). **O vozmozhnostyakh primeneniya lineynogo i vypuklogo programmirovaniya dlya kolichestvennogo analiza po spektram pogloshcheniya (II). [Linear and convex programming for quantitative analysis by using absorption spectra. (II).]** *Zavod. Lab.* 38(9): 1079-1083; 1972. (Russian)

The possibility of the application of linear and quadratic programming for quantitative analysis by using ab-

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sorption spectra is demonstrated on the basis of linuron and mixtures of α-, γ-, δ-, and ε-BHC. These methods were found to be highly useful for increasing the accuracy of the analysis of multicomponent systems with variable or unknown composition. The use of linear and quadratic programming requires a broad spectral range to increase the probability of a "window" in the spectra of the interfering components. These methods, combined with computerized data processing, also permit qualitative analysis of complicated mixtures by means of computer-accessible spectral lists.

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